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EXPERIMENTAL DATA ON THE PROBLEM OF SENSORY LATERAL DOMINANCE IN FEET AND HANDS

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EXPERIMENTAL DATA ON THE PROBLEM OF SENSORY LATERAL DOMINANCE IN FEET AND HANDS

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1. THE PROBLEM

Former experimental work with the problem of motor lateral dominance* utilized motor tests without vision and stimulated an interest in the preferential use of hands and feet in sensory activities. A preliminary testing of 40 subjects gave indecisive results; hence a larger group of 100 subjects were given three sensory foot tests and three sensory hand tests. These subjects were also given several motor tests to establish relationships between motor and sensory laterality. These motor hand and foot tests were given with and without vision to throw light upon the effect of lack of vision upon motor laterality. Since sensory practice of tactual discrimination was relatively slight, results should throw light upon possible inherent preferential use of either side in such activities.

2. TECHNIQUE OF EXPERIMENTATION

In the sensory tests the subject sat comfortably in a chair with a large opaque piece of cloth tied at the neck and suspended from the sides so the feet were not visible. The cloth was suspended sufficiently high so that hand tests could also be given under it without hindrance to motion. Three pairs of trials were given alternately; only the last two pairs were utilized in computations. A sorting tray was made with sponge rubber one inch wide and one-half inch thick fastened in an oval shape to a board. The rubber oval form was 8 inches wide and 9 inches long with an opening on the side toward the subjects' feet of 4 inches. Back of the 4-inch opening was a wooden tray one inch lower than the level of the oval space. The subject selected the object desired and pulled it back through this opening into the lower tray. This device was used for three sorting tests, one for form and two for size. A minimum of motor response was used in a pawing movement which did not differentiate either foot. Description of each test will be given when the results are considered.

* Gardner, L. Pearl, Experimental data on the problem of Motor Lateral Dominance in Feet and Hands. Psychological Record, 1941, vol. 5, no. 1, 1-63.

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TABLE I.

Time in Seconds and Errors in Sensory Tests of Feet and Hands.

No.	Feet												Hands											
	Marbles				Corks				Forms				Marbles				Corks				Forms			
	Time		Err.		Time		Err.		Time		Err.		Time		Err.		Time		Err.		Time		Err.	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
Men																								
1.	92	71	0	0	66	67	0	0	185	188	4	4	32	41	1	0	116	80	0	0	165	202	2	2
2.	62	82	3	3	85	104	1	4	282	276	6	5	28	34	0	0	37	78	1	2	144	286	0	2
3.	53	74	5	6	46	48	5	4	302	241	3	2	39	25	4	0	151	234	0	0	189	227	1	3
4.	37	66	1	1	92	69	0	1	49	94	0	1	23	23	0	0	145	45	0	3	65	89	1	2
5.	76	70	4	0	102	115	4	2	297	211	2	3	32	17	0	0	104	92	1	2	208	308	2	1
6.	46	40	0	0	51	44	3	4	192	241	2	4	21	30	1	0	102	53	0	0	271	188	1	2
7.	86	70	1	1	105	123	1	3	155	141	2	2	40	27	0	0	51	34	6	6	68	85	0	0
8.	47	43	1	0	77	58	1	0	166	142	2	2	26	17	0	0	124	118	0	0	152	187	2	3
9.	83	49	2	0	68	123	2	1	184	184	2	1	36	22	0	0	214	139	4	5	259	264	1	0
10.	56	64	1	0	87	65	1	0	432	369	1	1	22	37	0	1	85	122	2	3	205	245	0	1
11.	84	64	0	1	131	131	1	2	275	302	3	4	25	47	1	0	112	81	0	0	315	374	3	3
12.	68	68	1	3	149	130	2	2	169	170	4	3	45	33	0	0	157	119	0	0	125	164	1	1
13.	87	94	1	0	75	86	0	2	314	322	4	2	34	49	0	0	111	179	0	2	337	357	2	2
14.	38	47	2	3	59	69	1	6	208	149	5	3	27	22	2	0	58	50	5	5	117	82	1	6
15.	57	31	0	0	135	95	1	2	101	169	2	2	28	28	0	0	150	153	1	1	87	123	3	3
16.	124	127	1	1	176	92	1	0	216	200	4	4	29	35	0	0	64	94	3	1	120	121	4	2
17.	26	26	0	0	92	120	1	2	191	207	2	1	79	117	5	1	177	140	0	0	202	142	2	4
18.	56	54	0	0	98	73	0	0	185	168	2	3	32	26	0	0	62	49	2	1	232	268	1	2
19.	163	221	1	2	91	101	1	1	223	223	2	2	50	45	0	0	134	79	6	6	214	211	2	2
20.	71	67	1	0	101	94	4	1	429	308	1	0	49	42	1	0	55	95	0	0	307	292	3	2
Ave.	71	71	1	1	94	90	2	2	228	215	3	3	35	36	1	0	111	102	2	2	189	211	2	2

TABLE I (Cont.)

Time in Seconds and Errors in Sensory Tests of Feet and Hands.

No.	Feet												Hands											
	Marbles				Corks				Forms				Marbles				Corks				Forms			
	Time		Err.		Time		Err.		Time		Err.		Time		Err.		Time		Err.		Time		Err.	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
Women																								
1.	95	175	3	6	133	157	0	1	527	452	5	3	48	30	1	0	100	103	4	2	228	245	4	3
2.	106	81	1	0	185	175	0	1	103	93	4	1	35	51	0	0	64	67	2	4	99	141	2	4
3.	86	112	0	0	143	112	2	0	315	326	1	0	42	75	0	0	181	261	0	2	85	42	0	0
4.	96	59	4	1	74	127	3	3	88	76	5	8	21	22	0	0	65	70	1	4	94	117	5	6
5.	65	115	0	0	91	157	1	4	241	231	3	5	42	44	0	1	82	61	4	4	430	396	3	2
6.	117	90	0	1	147	98	0	1	319	311	3	4	76	52	0	0	86	84	2	2	264	228	1	2
7.	95	103	0	1	33	44	0	0	277	292	4	2	139	182	2	2	226	355	1	1	343	504	1	2
8.	73	84	0	0	69	69	2	0	202	312	2	5	41	51	0	0	77	59	0	1	429	468	2	1
9.	70	63	1	1	112	120	2	2	116	142	4	1	26	30	0	1	52	105	2	5	280	185	5	4
10.	40	74	4	3	25	43	1	4	147	135	7	4	29	37	0	0	25	50	0	0	127	96	3	4
11.	65	79	0	0	98	109	1	2	269	185	4	4	39	30	0	0	139	96	1	2	217	298	1	1
12.	54	35	3	1	91	61	3	0	91	79	1	2	28	38	0	0	109	92	0	0	109	101	1	3
13.	109	81	0	0	82	68	0	0	228	213	5	4	21	34	1	0	337	370	0	0	291	185	3	2
14.	68	81	1	1	117	101	5	2	276	251	2	4	32	32	1	0	60	91	3	2	260	207	1	3
15.	75	60	2	1	112	106	0	1	114	170	4	5	57	52	0	0	174	166	0	0	107	92	2	3
16.	65	51	0	0	95	104	0	0	171	185	2	4	43	27	0	0	79	87	3	3	384	271	3	2
17.	56	77	1	1	68	69	5	2	159	161	2	4	51	36	2	0	95	149	2	6	232	193	1	0
18.	64	71	0	0	194	161	1	1	290	214	4	0	37	35	0	0	73	89	0	0	282	229	0	2
19.	39	24	0	0	56	51	2	1	87	93	0	0	30	22	0	0	80	57	0	0	80	63	2	1
20.	71	56	0	1	105	76	3	3	80	101	4	1	41	32	0	0	99	105	0	0	119	139	2	1
Ave.	75	79	1	1	102	100	2	1	205	201	3	4	44	46	0	0	110	126	1	2	223	210	2	2
Ave. for all	73	75	1	1	98	95	2	2	216	208	3	3	39	41	1	0	110	114	1	2	206	210	2	2

3. PRELIMINARY SENSORY TESTING OF A SMALL GROUP

(1) Sensory Tests of Feet

Three sensory tests for feet were given to 40 subjects. Records of time and errors were kept for each test. Table I gives the individual data on such tests.

In the first test subjects selected 5 larger marbles from 5 smaller ones in the sorting tray. For the group the average error was the same for both sides. Details of data may be found in Tables I and II. The left foot averaged 73 seconds in performance and the right 75. In terms of seconds saved in paired performance 45% of the cases were quicker with the left with an average saving of 23 seconds and 50% were quicker with the right with an average saving of 17 seconds.

In the second test subjects separated 5 larger corks from 5 smaller ones in the sorting tray. The average performance time for the left was 98 seconds and for the right 95 seconds. Errors were the same for both feet. In terms of seconds saved 48% of the cases preferred the left and averaged a saving of 19 seconds while 48% preferred the right with an average saving of 25 seconds.

In the third test subjects placed the foot upon a wooden form which they could not see and identified this form from 4 other forms outlined on paper and presented visually. In this way 10 forms were selected, half of these were used for the first trial with the left foot and half for the first trial with the right foot. The average performance for the left foot was 216 seconds and for the right foot 208 seconds with the errors about the same for both feet. In terms of seconds saved in performance 43% of cases were more efficient with the left foot and averaged a saving of 28 seconds while 52% were more efficient with the right foot and averaged a saving of 38 seconds.

As these few tests showed, there was little difference between the left and right feet in sensory tests. The right in 2 of 3 tests was only a few seconds quicker than the left. In terms of seconds saved in paired performance 45% of cases preferred the left and 50% the right. The only interesting sex difference to be noticed was that women were a little slower than men on the sorting tests and a little faster on the form perception test.

TABLE II. Lateral Preference for Feet and Hands on Sensory Tests.

Test	Women						Men						All Cases					
	Number of cases			Per cent of cases			Number of cases			Per cent of cases			Number of cases			Per cent of cases		
	L	E	R	L	E	R	L	E	R	L	E	R	L	E	R	L	E	R
Feet																		
1. Sorting marbles	10	0	10	50	0	50	8	2	10	40	10	50	18	2	20	45	5	50
2. Sorting corks	9	1	10	45	5	50	10	1	9	50	5	45	19	2	19	48	5	48
3. Form-perception	9	0	11	45	0	55	8	2	10	40	10	50	17	2	21	43	5	52
Average				47		52				43		48				45		50
Hands																		
1. Sorting marbles	10	0	10	50	0	50	8	2	10	40	10	50	18	2	20	45	5	50
2. Sorting corks	13	0	7	65	0	35	7	0	13	35	0	65	20	0	20	50	0	50
3. Form-perception	7	0	13	35	0	65	15	0	5	75	0	25	22	0	18	55	0	45
Average				50		50				50		47				50		48

(2) Sensory Tests of Hands

In the tests with the hands the general experimental situation was the same. There was less difference between the sizes of marbles and corks for the hands. The perception forms were much more difficult than those used for the feet.

In the marble sorting test the left hand averaged 39 seconds in performance with 1.1 errors and the right 41 seconds with 0.3 error. In terms of seconds saved in paired performance 45% of the cases preferred the left hand and averaged a saving of 14 seconds while 50% of cases preferred the right and averaged a saving of 11 seconds.

In the cork sorting test the left hand averaged 110 and the right 114 with slightly less error in the left hand. In terms of seconds saved in paired performance 50% preferred the left and 50% the right hand.

In the form perception test the left hand averaged 206 seconds for performance and the right 210 with the errors the same for both hands. The left hand was preferred by 55% of cases and the right by 45%.

The sensory tests for hands showed a very slight fairly consistent advantage in time for the left hand over the right. In terms of seconds saved in paired performance the left hand was preferred in 50% of the cases and the right in 48%. On the form perception test 35% of the women and 75% of the men were quicker with the left hand. This test necessitated very fine discriminations; possibly the left hand of men with less thickened skin from sports and work, was more useful.

The preliminary sensory tests of hand and feet showed relatively small and somewhat inconsistent differences between the two sides. With practice effects reduced to a minimum in sensory tests, there appeared no clear preference for either side in sensory learning.

4. RESULTS OF DETAILED SENSORY TESTING OF GROUP THREE

To test further the indecisive results of the preliminary series of sensory tests, another group of 100 college students were given three foot and three hand sensory tests of varying difficulty. Tables III, IV, VI and VII give individual data and Tables V, VIII and IX summarize data.

TABLE III.

Performance Time in Seconds for Men on the Sensory Foot and Hand Tests Without Vision.

No. of Subject	Feet						Hands					
	Marbles		Cubes		Corks		Marbles		Cubes		Corks	
	L	R	L	R	L	R	L	R	L	R	L	R
1.	72	79	96	93	82	69	40	31	41	46	81	90
2.	41	39	138	103	102	129	40	38	43	41	134	170
3.	54	61	86	103	75	69	21	24	42	37	97	83
4.	52	54	131	87	83	63	50	15	46	29	58	60
5.	58	82	90	110	53	60	29	23	47	34	126	96
6.	45	61	69	61	55	49	25	25	50	27	47	46
7.	13	15	83	109	34	56	17	16	30	23	80	71
8.	50	61	82	74	43	43	22	47	61	40	88	100
9.	72	60	112	133	144	101	39	47	65	58	87	103
10.	57	33	33	63	90	102	36	38	40	51	54	67
11.	84	63	56	58	37	54	27	21	44	35	64	56
12.	97	112	70	62	87	64	64	30	47	36	71	100
13.	69	76	78	66	119	70	28	34	55	73	277	247
14.	65	50	90	95	66	58	30	30	35	33	63	90
15.	35	44	58	48	45	40	26	14	35	23	74	53
16.	67	81	73	87	124	102	38	38	78	63	55	101
17.	101	52	132	114	248	186	40	29	49	31	195	206
18.	42	59	52	54	60	74	33	31	24	55	66	68
19.	100	113	129	112	152	139	30	42	48	61	165	143
20.	81	72	71	55	135	135	23	21	33	34	53	45
21.	127	102	220	237	168	195	57	40	23	36	81	87
22.	104	93	168	151	116	101	17	20	57	63	52	62
23.	94	97	146	137	100	150	22	35	47	42	46	50
24.	54	43	127	114	104	110	21	21	19	23	115	107

TABLE III (Cont.)

	Feet						Hands					
	Marbles		Cubes		Corks		Marbles		Cubes		Corks	
	L	R	L	R	L	R	L	R	L	R	L	R
25.	72	79	96	93	82	69	40	31	41	46	81	90
26.	41	39	138	103	102	129	40	38	43	41	134	170
27.	54	61	86	103	75	69	21	24	42	37	97	83
28.	52	54	131	87	83	63	50	15	46	29	58	60
29.	58	82	90	110	53	60	29	23	47	34	126	96
30.	45	61	69	61	55	49	25	25	50	27	47	46
31.	13	15	83	109	34	56	17	16	30	23	80	71
32.	50	61	82	74	43	43	22	47	61	40	88	100
33.	72	60	112	133	144	101	39	47	65	58	87	103
34.	57	33	33	63	90	102	36	38	40	51	54	67
35.	84	63	56	58	37	54	27	21	44	35	64	56
36.	97	112	70	62	87	64	64	30	47	36	71	100
37.	69	76	78	66	119	70	28	34	55	73	277	247
38.	65	50	90	95	66	58	30	30	35	33	63	90
39.	35	44	58	48	45	40	26	14	35	23	74	53
40.	67	81	73	87	124	102	38	38	78	63	55	101
41.	101	52	132	114	248	186	40	29	49	31	195	206
42.	42	59	52	54	60	74	33	31	24	55	66	68
43.	100	113	129	112	152	139	30	42	48	61	165	143
44.	81	72	71	55	135	135	23	21	33	34	53	45
45.	127	102	220	237	168	195	57	40	23	36	81	87
46.	104	93	168	151	116	101	17	20	57	63	52	62
47.	94	97	146	137	100	150	22	35	47	42	46	50
48.	54	43	127	114	104	110	21	21	19	23	115	107

24.	54	43	127	114	104	110	21	21	19	23	115	107

TABLE III (Cont.)

No. of Subject	Feet						Hands					
	Marbles		Cubes		Corks		Marbles		Cubes		Corks	
	L	R	L	R	L	R	L	R	L	R	L	R
25.	43	38	71	49	66	40	32	25	32	22	62	66
26.	37	66	85	135	92	69	23	23	40	29	145	45
27.	62	82	70	81	85	104	28	34	73	63	37	78
28.	163	221	91	64	91	101	50	45	30	25	134	79
29.	68	70	126	108	121	108	44	44	65	77	91	90
30.	74	107	121	171	153	177	55	44	54	36	160	143
31.	80	43	77	66	98	111	33	26	41	35	85	53
32.	89	78	51	66	97	130	18	22	25	19	36	36
33.	90	64	115	44	82	88	14	20	27	21	69	65
34.	98	103	120	102	174	173	33	31	24	31	85	66
35.	86	105	108	110	69	90	10	17	34	26	54	48
36.	48	39	45	64	46	78	36	41	37	37	70	72
37.	162	123	112	92	230	159	31	31	48	17	125	129
38.	47	54	137	123	147	153	26	27	25	44	85	59
39.	80	81	218	163	191	164	49	51	46	41	121	152
40.	48	87	113	91	138	96	49	38	40	38	79	84
41.	91	80	106	149	144	159	35	34	43	54	159	168
42.	61	53	98	103	152	167	45	32	48	53	85	95
43.	58	118	106	93	110	122	20	14	25	29	93	48
44.	63	59	91	93	147	107	23	23	27	37	85	114
45.	58	71	135	105	148	175	42	29	34	42	171	133
46.	35	36	115	94	89	81	16	19	30	34	37	43
47.	41	37	74	57	66	59	35	20	28	27	57	119
48.	96	167	156	137	162	96	39	30	60	46	105	132
49.	67	83	77	83	107	109	27	20	55	32	60	85
50.	40	57	131	103	74	130	33	45	28	45	122	56
Average	70.4	74.5	102.8	97.4	108.0	105.3	32.4	29.9	41.6	39.1	92.8	91.8

(1) Sensory Tests of Feet

In the marble sorting test, subjects sorted out 5 larger marbles of one inch in diameter from 5 smaller ones of three-quarters of an inch in diameter. The 5 large marbles were placed in the rubber oval on the side away from the subject next to the rubber border of the sorting tray with the 5 smaller marbles in front of them. Since the sorting tray tipped away from the subject slightly, the marbles tended to remain in this position until moved by the subject.

The mean for the left foot for all cases was 72.7 seconds with a sigma of 27.9 and with an average error of 2.0; this mean for the right foot for all cases was 74.3 seconds with a sigma of 34.4 and with an average error of 2.0. Of all cases 54% were quicker with the left and 45% with the right foot. In terms of seconds saved the left and right both averaged 18.0.

In comparing the sexes, the mean for the left foot of men was 70.4 seconds with a sigma of 29.7 with an average error of 2.2; this mean for women was 74.9 seconds with a sigma of 20.7 with an average error of 1.8. The mean for the right foot of men was 74.5 with a sigma of 35.8 with an average error of 2.4; this mean for women was 74.1 with a sigma of 32.9 with an error of 1.6. Sixty percent of men and 48% of the women were quicker with the left while 40% of men and 50% of women were quicker with the right foot. The average saving with the left for men was 17.9 seconds and for women 18.6; with the right, men averaged 16.6 and women 19.6. Men showed slightly greater ease of performance of the left in comparison with the right while women showed little difference between the feet on this test. Men made more errors with both feet than women. The right foot was more variable for both sexes than the left.

In the form sorting test the subject was to select 5 one inch cubes from 5 one inch cylinders. Although the cylinders were one inch in diameter and one inch in height, their volume was slightly less than that of the cubes. This difference, however, was imperceptible to the usual foot. The cubes were distinguished largely from the cylinders by the sharper corners and by the fact that they would not roll. The five cubes were set in a row across the center of the sorting device with 2 cylinders on the flat side in the space between them and the subject's feet and the 3 others on the flat side beyond the row of

TABLE IV

Performance Time in Seconds for Women on the Sensory Foot and Hand Tests without Vision.

TABLE IV

Performance Time in Seconds for Women on the Sensory Foot and Hand Tests without Vision.

No. of Subject	Feet						Hands					
	Marbles		Cubes		Corks		Marbles		Cubes		Corks	
	L	R	L	R	L	R	L	R	L	R	L	R
51.	43	54	74	55	55	61	34	40	25	21	77	102
52.	85	87	133	175	69	84	38	31	58	65	141	124
53.	67	68	176	166	96	115	32	43	35	44	158	95
54.	63	50	127	84	72	70	37	49	31	56	37	62
55.	87	143	252	322	102	87	38	46	28	34	100	116
56.	165	96	130	97	140	197	35	26	32	48	148	297
57.	67	46	139	124	115	83	95	29	37	54	76	88
58.	66	68	133	126	96	111	21	20	45	46	96	104
59.	118	129	176	119	74	121	27	25	64	53	104	157
60.	48	58	53	54	62	81	20	16	22	26	30	40
61.	42	55	67	74	75	86	33	20	43	57	60	52
62.	98	62	135	160	103	152	28	35	49	69	91	123
63.	52	44	60	62	55	46	21	24	51	36	48	62
64.	47	37	75	80	111	139	19	25	29	44	144	74
65.	118	166	136	95	131	74	26	19	44	67	179	150
66.	42	50	115	122	96	115	23	22	25	25	166	153
67.	99	94	94	93	73	86	23	30	36	23	45	38
68.	96	95	98	109	118	101	55	36	39	42	96	72
69.	50	51	46	55	39	48	30	23	25	28	38	67
70.	62	50	90	89	121	73	17	35	37	48	48	78
71.	99	48	141	130	102	118	32	24	45	21	69	44
72.	139	116	121	147	194	77	42	58	31	31	181	215
73.	83	75	142	132	145	111	52	41	58	45	79	152
74.	59	65	138	92	93	119	41	28	46	58	53	46

TABLE IV (Cont.)

No. of Subject	Feet						Hands					
	Marbles		Cubes		Corks		Marbles		Cubes		Corks	
	L	R	L	R	L	R	L	R	L	R	L	R
75.	105	81	111	101	230	200	54	37	32	34	115	108
76.	95	175	151	185	133	157	48	30	110	55	100	103
77.	86	112	189	110	143	112	42	75	36	32	181	261
78.	76	127	82	106	141	143	23	19	32	45	64	72
79.	60	64	76	81	115	127	19	26	30	37	57	63
80.	79	57	106	85	108	113	40	47	32	43	91	120
81.	54	56	83	78	90	87	27	32	35	49	80	58
82.	72	91	190	210	95	96	59	32	30	64	84	117
83.	36	66	107	85	115	127	38	37	38	43	87	87
84.	58	42	62	58	62	60	20	19	35	16	88	88
85.	83	60	119	95	129	124	26	28	25	39	137	46
86.	68	51	118	119	94	128	34	40	22	24	85	62
87.	46	48	121	85	107	122	46	24	56	37	83	71
88.	80	56	145	77	84	102	18	28	16	15	72	50
89.	49	46	68	83	96	83	15	23	48	48	160	125
90.	68	52	106	86	175	71	38	31	22	35	40	35
91.	66	70	139	103	200	138	23	28	28	26	95	54
92.	60	60	105	133	147	158	40	31	51	88	130	77
93.	109	87	121	159	144	127	30	39	52	42	154	147
94.	90	56	115	110	91	126	22	23	41	40	49	72
95.	83	133	105	103	144	164	26	35	42	39	81	91
96.	52	37	101	115	76	78	25	21	32	31	82	68
97.	41	46	154	156	146	134	49	38	50	35	52	85
98.	61	66	185	93	117	108	36	37	39	42	134	60
99.	111	109	119	150	173	129	50	45	37	45	289	273
100.	63	49	115	60	76	74	30	24	29	23	36	47
Average	74.9	74.1	118.8	111.8	111.3	108.9	33.9	31.9	38.7	41.4	97.8	99.0
Average for all	72.7	74.3	110.8	104.6	108.7	107.1	33.2	30.9	40.1	40.3	85.3	85.4

Average	74.9	74.1		118.8	111.8		111.3	108.9		33.9	31.9		38.7	41.4		97.8	99.0	
Average for all	72.7	74.3		110.8	104.6		109.7	107.1		33.2	30.9		40.1	40.2		95.3	95.4	

TABLE V.

Comparison of Left and Right Feet and Hands of Subjects in Terms of Seconds Saved with the Preferred Member in Paired Trials on Sensory Tests.

	Feet									Hands								
	Marbles			Cubes			Corks			Marbles			Cubes			Corks		
	R	L	E*	R	L	E	R	L	E	R	L	E	R	L	E	R	L	E
Men																		
No. cases	20	30	0	30	20	0	24	24	2	25	17	8	30	19	1	21	28	1
Average saving	16.6	17.9	.....	20.8	17.9	.....	25.4	19.7	.....	9.8	6.9	.....	10.8	10.5	.....	25.4	17.2	.....
Women																		
No. cases	25	24	1	28	22	0	22	28	0	27	23	0	18	29	3	24	24	2
Average saving	19.6	18.6	.....	27.6	19.0	.....	30.2	19.4	.....	11.1	8.6	.....	12.0	12.0	.....	28.5	31.1	.....
All Cases																		
No. cases	45	54	1	58	42	0	46	52	2	52	40	8	48	48	4	45	52	3
Average saving	18.3	18.2	.....	24.0	18.4	.....	27.7	19.5	.....	10.5	7.9	.....	11.2	11.4	.....	27.1	23.6	.....

*Equal.

cubes. The subject never saw this arrangement and seemed to be unaware of it.

The mean performance for the cases was 110.8 seconds with the left foot with a sigma of 39.6 and with an average error of 2.7. The mean performance for the right foot was 104.6 seconds with a sigma of 42.8 and with an average error of 2.5. Of all the cases 42% were quicker with the left foot and averaged a saving of 18.4 seconds while 58% were quicker with the right foot and averaged a saving of 24 seconds. The right foot showed a slight advantage over the left in time, errors and preferred use.

In comparing the sexes the mean for the left foot of men was 102.8 seconds with a sigma of 38.1 and with an average error of 2.8; this mean for women was 118.8 seconds with a sigma of 39.6 and with an average error of 2.6. The mean for the right foot of men was 97.4 seconds with a sigma of 33.8 and with an average error of 2.4; this mean for women was 111.8 seconds with a sigma of 46.8 and with an average error of 2.6. In terms of seconds saved in performance 40% of men and 44% of women were quicker with the left while 60% of men and 56% of women were swifter with the right hand. Of these cases men showed an average saving of 17.9 seconds with the left and women 19.0. With the right hand men averaged a saving of 20.8 and women 27.6 seconds. Women were somewhat slower than men and about the same in accuracy. Both sexes showed a slightly greater preference for the right foot in time of performance and percent of choice. Women were more variable in the right foot and men in the left foot.

The third foot sensory test involved sorting 5 large corks with a top diameter of 1¼ inches from 5 smaller ones with a top diameter of ⅞ inch. The bottom diameter of large corks was 1 inch and the small ones ⅝ inch. Large corks were ⅛ inch longer than the smaller ones. The corks could be differentiated only on the basis of perception of total volume. This was a very difficult test.

The mean performance for all left feet was 109.7 seconds with a sigma of 43.9 and with an average error of 2.2; the mean performance for all right feet was 107.1 seconds with a sigma of 38.2 and with an average error of 2.4. In the group 52% of the cases were swifter with the left and 46% with the right foot. In terms of seconds saved

TABLE VI

TABLE VI

Errors on Foot and Hand Sensory Tests for Men

No. of Subject	Feet								Hands							
	Marbles		Cubes		Corks		Total		Marbles		Cubes		Corks		Total	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
1.	4	4	7	2	5	7	16	13	0	0	0	0	2	3	2	3
2.	3	6	5	5	3	2	11	13	0	0	0	0	4	2	4	2
3.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5.	2	0	3	3	0	2	5	5	2	0	0	0	0	2	2	2
6.	4	3	8	8	4	6	16	17	0	0	0	0	6	2	6	2
7.	2	5	4	4	1	4	7	13	1	0	0	0	2	3	3	3
8.	4	2	2	3	1	1	7	6	0	1	1	0	1	0	2	1
9.	0	2	1	0	0	0	1	2	0	0	0	0	2	0	2	0
10.	1	0	3	0	4	3	8	3	0	0	0	0	0	3	0	3
11.	0	3	5	4	0	0	5	7	0	0	1	0	2	1	3	1
12.	0	1	6	2	1	0	7	3	2	0	0	0	0	0	2	0
13.	1	4	7	5	5	0	13	9	1	0	0	0	0	0	1	0
14.	3	5	1	1	7	5	11	11	1	0	2	0	4	9	7	9
15.	3	7	0	3	4	1	7	11	1	0	0	0	3	0	4	0
16.	2	1	2	3	6	2	10	6	3	0	0	0	4	2	7	2
17.	3	1	1	3	2	2	6	6	1	0	0	0	5	6	6	6
18.	1	3	2	2	3	3	6	8	1	0	0	0	2	3	3	3
19.	0	0	3	2	0	0	3	2	0	0	1	0	1	0	2	0
20.	2	4	4	3	3	4	9	11	0	0	0	1	2	1	2	2
21.	3	3	3	3	3	4	9	10	1	0	0	0	3	0	4	0
22.	3	1	2	4	3	1	8	6	0	0	0	0	0	2	0	2
23.	2	1	0	4	2	2	4	7	0	0	0	0	1	2	1	2
24.	0	0	2	1	2	1	4	2	0	0	0	0	1	0	1	0

TABLE VI (Cont.)

No. of Subject	Feet								Hands							
	Marbles		Cubes		Corks		Total		Marbles		Cubes		Corks		Total	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
25.	1	3	2	1	1	1	4	5	0	0	0	0	2	2	2	2
26.	1	1	0	0	0	1	1	2	0	0	0	0	0	3	0	3
27.	3	3	5	3	1	4	9	10	0	0	0	0	1	2	1	2
28.	1	2	2	0	1	1	4	3	0	0	0	0	6	6	6	6
29.	0	0	5	1	4	4	9	5	2	0	1	0	3	2	6	2
30.	0	0	0	2	4	2	4	4	1	0	0	0	0	0	1	0
31.	1	1	3	4	1	1	5	6	0	0	0	0	0	0	0	0
32.	0	2	2	1	2	1	4	4	0	0	0	0	0	2	0	2
33.	3	4	0	0	0	2	3	6	1	0	0	0	3	0	4	0
34.	0	1	1	3	3	3	4	7	0	0	0	0	4	1	4	1
35.	1	3	5	1	0	1	6	5	0	1	1	0	3	0	4	1
36.	3	6	4	5	6	10	13	21	2	0	0	0	2	1	4	1
37.	7	1	2	2	4	2	13	5	0	0	0	1	0	0	0	1
38.	2	0	3	2	0	2	5	4	2	0	2	0	1	0	5	0
39.	0	1	1	1	0	2	1	4	0	0	0	0	0	1	0	1
40.	3	4	4	1	4	0	11	5	0	1	1	0	0	2	1	3
41.	6	2	1	3	8	9	15	14	0	0	0	0	0	1	0	1
42.	1	0	0	1	1	0	2	1	0	0	0	0	0	1	0	1
43.	4	3	2	4	1	4	7	11	2	0	0	0	6	1	8	1
44.	2	1	2	3	2	4	6	8	1	0	0	0	2	2	3	2
45.	2	1	3	0	1	4	6	5	0	0	0	0	4	1	4	1
46.	3	4	5	1	1	0	9	5	0	0	1	0	2	3	3	3
47.	2	5	6	4	4	1	12	10	1	0	0	0	0	3	1	3
48.	5	2	1	2	3	0	9	4	0	0	0	1	5	3	5	4
49.	5	5	4	5	2	1	11	11	0	0	1	0	1	4	2	4
50.	5	3	1	1	4	4	10	8	0	0	0	0	5	1	5	1
Average	2.2	2.4	2.8	2.4	2.4	2.4	7.4	7.2	0.5	0.1	0.3	0.1	2.0	1.7	2.8	1.9

TABLE VII.

50.	5	3	1	1	4	4	10	8	0	0	0	0	5	1	5	1
Average	2.2	2.4	2.8	2.4	2.4	2.4	7.4	7.2	0.5	0.1	0.3	0.1	2.0	1.7	2.8	1.9

TABLE VII.

Errors on Foot and Hand Sensory Tests for Women.

No. of subject	Feet								Hands							
	Marbles		Cubes		Corks		Total		Marbles		Cubes		Corks		Total	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
51.	0	0	4	4	4	5	8	9	1	0	0	0	6	9	7	9
52.	2	0	2	3	0	1	4	4	0	0	0	0	0	0	0	0
53.	4	1	7	5	0	0	11	6	0	0	2	0	4	3	6	3
54.	1	2	6	4	2	2	9	8	0	2	0	0	0	3	0	5
55.	3	7	2	1	0	1	5	9	0	0	0	0	0	1	0	1
56.	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	2
57.	0	0	1	0	0	0	1	0	0	0	0	0	3	0	3	0
58.	1	0	3	2	0	3	4	5	0	0	0	0	2	1	2	1
59.	3	4	1	2	2	5	6	11	0	1	0	0	2	0	2	1
60.	6	4	5	5	5	6	16	15	2	0	0	0	5	8	7	8
61.	3	1	4	3	3	3	10	7	0	1	0	0	4	4	4	5
62.	1	0	3	2	0	1	4	3	0	0	0	0	1	0	1	0
63.	1	1	3	7	0	3	4	11	0	1	0	0	3	2	3	3
64.	0	2	1	3	1	0	2	5	0	0	0	0	4	1	4	1
65.	4	5	2	1	1	0	7	6	1	0	0	0	2	6	3	6
66.	0	1	1	1	1	2	2	4	0	0	0	0	0	0	0	0
67.	3	4	3	3	3	5	9	12	0	0	0	0	0	1	0	1
68.	1	0	3	3	6	7	10	10	4	1	0	0	6	4	10	5
69.	4	7	5	2	2	1	11	10	1	0	0	4	0	4	1	8
70.	4	0	6	4	2	3	12	7	0	0	0	0	1	3	1	3
71.	4	0	1	2	1	4	6	6	0	0	0	0	1	1	1	1
72.	0	0	0	1	1	0	1	1	0	0	0	0	0	3	0	3
73.	2	1	2	2	2	1	6	4	1	0	0	0	1	5	2	5
74.	2	0	5	4	3	7	10	11	0	0	0	0	5	1	5	1

TABLE VII (Cont.)

No. of subject	Feet								Hands							
	Marbles		Cubes		Corks		Total		Marbles		Cubes		Corks		Total	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
75.	1	0	3	1	3	3	7	4	0	0	0	0	0	0	0	0
76.	3	6	2	5	0	1	5	12	1	0	0	0	4	2	5	2
77.	0	0	3	2	2	0	5	2	0	0	0	1	0	2	0	3
78.	0	1	1	3	4	2	5	6	1	0	1	0	5	3	7	3
79.	3	3	2	3	1	4	6	10	2	1	0	0	1	1	3	2
80.	0	0	7	5	4	6	11	11	0	0	1	0	1	0	2	0
81.	2	0	3	3	3	4	8	7	1	3	0	0	3	3	4	6
82.	1	0	1	3	0	3	2	6	0	0	0	0	0	0	0	0
83.	1	4	4	1	3	1	8	6	0	0	0	0	5	1	5	1
84.	1	1	0	0	0	0	1	1	0	0	0	0	2	2	2	2
85.	1	0	2	0	5	2	8	2	0	0	0	0	2	0	2	0
86.	0	0	2	1	1	2	3	3	0	0	0	0	0	0	0	0
87.	0	1	2	2	0	1	2	4	0	0	0	0	2	0	2	0
88.	2	0	5	2	3	1	10	3	0	0	0	0	1	2	1	2
89.	1	0	1	1	2	0	4	1	0	0	0	0	1	2	1	2
90.	5	1	0	1	5	1	10	3	0	0	0	0	0	0	0	0
91.	0	1	1	1	0	2	1	4	0	0	0	0	2	0	2	0
92.	3	4	3	2	3	5	9	11	1	0	0	0	2	2	3	2
93.	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
94.	5	5	1	2	2	6	8	13	2	1	0	0	0	4	2	5
95.	3	8	4	4	2	5	9	17	0	1	0	0	3	1	3	2
96.	4	1	1	4	5	1	10	6	0	0	0	0	4	3	4	3
97.	2	4	0	6	2	1	4	11	2	0	0	0	0	2	2	2
98.	1	0	3	3	1	3	5	6	0	0	0	0	2	1	2	1
99.	3	0	2	3	3	5	8	8	1	0	0	0	5	9	6	9
100	0	1	4	8	3	1	7	10	0	0	0	0	1	2	1	2
Average	1.8	1.6	2.6	2.6	1.9	2.4	6.3	6.6	0.4	0.2	0.1	0.1	1.9	2.1	2.4	2.4
Average for all	2.0	2.0	2.7	2.5	2.2	2.4	6.9	6.9	0.5	0.2	0.2	0.1	1.9	1.9	2.6	2.1

by the preferred foot the left averaged 19.5 and the right 27.7. The differences between the feet were very slight.

From the standpoint of sex difference the mean for the left foot of men was 108.0 seconds with a sigma of 47.5 and with an average error of 2.4. The mean for the left foot of women was 111.3 with a sigma of 39.9 and an average error of 1.9. The mean for the right of men was 105.3 seconds with a sigma of 42.1 and with an average error of 2.4; the mean for the right of women was 108.9 with a sigma of 33.8 and with an average error of 2.4. In terms of the quicker performance 48% of men and 56% of women were quicker with the left while 48% of women and 44% of men were quicker with the right. The average saving for men with the left was 19.7 seconds and for women 19.4 while the average saving with the right for men was 25.4 and for women 30.2 seconds. Women required a little longer time with both feet than men but they had slightly less errors than men. Both sexes showed a slight advantage for the right foot in performance time and greater variability in the left foot.

To summarize the sensory foot tests from Tables VII, VIII and IX, certain comparisons should be stated. The means for all cases on the 3 tests differed less than 10 seconds with right means less than left ones in 2 of 3 tests. The right midscores for all 3 tests were less than left ones. In terms of the average quicker performance for the 3 tests together 49% were quicker with the left and 50% with the right foot. With the more difficult tests sigma increased but the difference between sigmas for the left and right feet was under 10. In 2 of 3 tests right sigmas were greater than left ones. The average error for both feet on the 3 tests combined was the same 6.9. Women took longer to make their selections and were more accurate than men. Women averaged 6.3 errors with the left and 6.6 errors with the right while men averaged 7.4 errors with the left and 7.2 errors with the right. If the decrease or increase of the performance time of the third trial over the first trial be considered for all cases, the difference between the feet was slight. An average of the results of the three foot sensory tests showed the left foot decreased time in 66% of cases with an average decrease of 20.8 seconds; the left increased time in 33% of cases with an average increase of 15.9 seconds. On the other hand the right decreased time in 64% of cases with an average decrease of 24.5

Average for all	2.0	2.0	2.7	2.5	2.2	2.4	6.9	6.9	0.5	0.2	0.2	0.1	1.9	1.9	2.1	2.4	2.6	2.1	2.4	2.4	2.6	2.1	2.4	2.4

seconds; the right increased time in 34% of cases with an average increase of 15.3 seconds. On foot sensory tests where practice effects were small, there seemed to be very little difference between the sides. The right side showed a possible slight preference, more pronounced in the case of women than men. Table XIII should be consulted for additional data.

(2) Sensory Tests of Hands

The hand sensory tests were the same as those for the feet except the sizes of the objects involved required more careful discrimination. In the marble sorting test the large marbles had a diameter of three-fourths of an inch and the small ones five-eighths of an inch. These were placed in the sorting device in the same position as for the foot tests. The feel of coldness of the marbles probably accented the size differences and made this an easy test.

The mean performance for all left hands was 33.2 seconds with a sigma of 13.1 and with an average error of 0.5; the mean performance for all right hands was 30.9 with a sigma of 10.4 and with an average error of 0.2. Of the cases 40% were swifter with the left and 52% with the right hand. In terms of seconds saved by the preferred hand the left averaged 7.9 seconds and the right 10.5 seconds. The right hand showed a slight consistent advantage in time, error and preference. Since the other two hand tests showed no such clear preference of the right hand, the practice effects of the right hand in sampling temperatures in general living may have affected the results.

With regard to sex differences the mean for the left hands of men was 32.4 seconds with a sigma of 11.9 and with an average error of 0.5. The mean for the left hand of women was 33.9 seconds with a sigma of 14.1 and with an average error of 0.4. The mean for the right of men was 29.9 seconds with a sigma of 9.8 and with an average error of 0.1; this mean for the right of women was 31.9 seconds with a sigma of 11.0 and with an average error of 0.2. In terms of the quicker performance 34% of men and 46% of women were quicker with the left, while 50% of the men and 54% of the women were quicker with the right. While 16% of the men gave equal performance with either hand, none of the women did so. The average saving for men with the left was 6.9 and for women 8.6 while men

TABLE VIII.

Summary of Mean, Median and Sigma for Laterality Tests of Sensory and Motor Types.

Test	Number of Cases			Left								
				Men			Women			Total		
	M	F	T	Mean	Mid.	Sigma	Mean	Mid.	Sigma	Mean	Mid.	Sigma
Sensory foot tests:												
1. Marbles	50	50	100	70.4	66.	29.7	74.9	67.5	20.7	72.7	67.	27.9
2. Cubes	50	50	100	102.8	97.	38.1	118.8	118.5	39.6	110.8	111.5	39.6
3. Corks	50	50	100	108.0	99.	47.5	111.3	105.	39.9	109.7	105.5	43.9
Average				93.7	87.3	38.4	101.7	97.0	33.4	97.7	94.7	37.1
Sensory hand tests:												
1. Marbles	50	50	100	32.4	31.5	11.9	33.9	32.	14.1	33.2	32.	13.1
2. Cubes	50	50	100	41.6	41.	13.7	38.7	36.	15.2	40.1	37.5	14.6
3. Corks	50	50	100	92.8	83.	46.2	97.8	86.	49.9	95.3	85.	48.2
Average				55.6	51.8	23.9	56.8	51.3	26.4	56.2	51.5	25.3
Motor foot tests without vision:												
1. Grasping-carrying	50	50	100	44.2	39.	20.9	42.6	35.	26.0	43.4	37.5	23.3
2. Cross-movement	50	50	100	11.6	11.	6.5	13.6	11.	6.0	12.6	11.	6.4
3. Manipulation	50	50	100	127.8	99.5	80.2	109.6	89.	64.4	118.7	92.	73.3
Average				61.2	49.8	35.9	55.3	45.	32.1	58.2	46.	46.8
Motor foot tests with vision:												
1. Grasping-carrying	50	50	100	27.0	23.	17.0	25.5	23.	11.5	26.3	23.	10.8
2. Cross-movement	50	50	100	8.3	8.	5.1	9.7	10.	5.4	9.0	8.	5.3
3. Manipulation	50	50	100	46.8	40.5	37.7	34.9	33.	10.1	40.9	35.	13.4
Average				27.4	23.8	19.9	23.4	22.	9.0	25.4	22.	9.8
Motor hand tests without vision:												
1. Grasping-carrying	50	50	100	36.0	36.	12.2	36.7	34.	12.4	36.4	35.	12.5
2. Cross-movement	50	50	100	7.3	6.	4.0	8.4	7.	4.7	7.9	7.	4.4
3. Manipulation	50	50	100	49.5	48.5	13.6	49.4	48.5	10.7	49.5	48.5	12.2
Average				30.9	30.2	9.9	31.5	29.8	9.3	31.3	30.2	9.7
Motor hand tests with vision:												
1. Grasping-carrying	50	50	100	23.3	22.	8.0	23.0	21.	8.7	23.2	21.5	8.4
2. Cross-movement	50	50	100	5.8	5.	3.2	6.8	6.	3.0	6.3	6.	3.1
3. Manipulation	50	50	100	22.1	22.	6.1	20.7	21.	4.9	21.4	21.	5.6
Average				17.1	16.3	5.8	16.8	16.	5.5	17.0	16.2	5.7

TABLE VIII (Cont.)

Summary of Mean, Median and Sigma for Laterality Tests of Sensory and Motor Types.

Test	Number of Cases			Right								
				Men			Women			Total		
	M	F	T	Mean	Mid.	Sigma	Mean	Mid.	Sigma	Mean	Mid.	Sigma
Sensory foot tests:												
1. Marbles	50	50	100	74.5	72.5	35.8	74.1	61.	32.9	74.3	64.	34.4
2. Cubes	50	50	100	97.4	94.5	33.8	111.8	102.	46.8	104.6	96.	42.8
3. Corks	50	50	100	105.3	101.5	42.1	108.9	116.5	33.8	107.1	101.5	38.2
Average				92.4	89.5	37.2	98.3	93.2	37.8	95.3	87.2	38.5
Sensory hand tests:												
1. Marbles	50	50	100	29.9	30.	9.8	31.9	30.	11.0	30.9	30.	10.4
2. Cubes	50	50	100	39.1	36.	14.6	41.4	42.	14.0	40.2	37.5	14.3
3. Corks	50	50	100	91.8	84.5	43.5	99.0	81.5	57.9	95.4	84.5	51.7
Average				53.6	50.2	22.6	57.4	51.2	27.6	55.5	50.7	25.5
Motor foot tests without vision:												
1. Grasping-carrying	50	50	100	48.6	40.5	34.0	37.5	36.5	14.2	43.0	39.	26.5
2. Cross-movement	50	50	100	11.3	10.	6.0	13.5	11.	6.6	12.4	11.	6.5
3. Manipulation	50	50	100	107.8	92.	57.3	96.6	75.	83.5	102.2	81.	71.8
Average				55.9	47.5	32.4	49.2	40.8	34.8	52.5	43.7	34.9
Motor foot tests with vision:												
1. Grasping-carrying	50	50	100	26.4	27.	14.1	21.9	21.	7.1	24.2	21.5	10.8
2. Cross-movement	50	50	100	8.0	8.	4.4	9.4	9.5	5.0	8.7	8.	4.9
3. Manipulation	50	50	100	38.8	31.5	24.7	32.4	30.5	12.9	35.6	31.	19.9
Average				24.4	22.2	14.4	21.2	20.3	8.3	22.8	20.2	11.9
Motor hand tests without vision:												
1. Grasping-carrying	50	50	100	36.9	37.	13.3	35.0	35.	10.8	36.0	36.	12.2
2. Cross-movement	50	50	100	6.8	6.	3.8	8.3	7.	4.5	7.5	7.	4.2
3. Manipulation	50	50	100	45.9	46.5	11.6	45.9	44.5	11.3	45.9	44.5	11.4
Average				29.9	29.8	9.6	29.7	28.8	8.9	29.8	29.2	9.3
Motor hand tests with vision:												
1. Grasping-carrying	50	50	100	22.9	23.5	7.4	23.4	23.	7.3	23.1	23.	7.3
2. Cross-movement	50	50	100	5.7	5.	3.0	6.8	6.	3.5	6.3	6.	3.2
3. Manipulation	50	50	100	21.3	21.	5.4	19.9	20.	4.9	20.6	20.5	5.2
Average				16.6	16.5	5.3	16.7	16.3	5.2	16.7	16.5	5.2

averaged a saving of 9.8 with the right and women 11.1 seconds. Both sexes showed a clear consistent advantage with right hands in time, error and preference as well as greater variability in left hands. Individual data will be found in Tables III, IV, V, VI and VII.

In the cube sorting test cubes were one-quarter of an inch on the sides and the small cylinders were also one-quarter of an inch in diameter and height. This test was slightly more difficult than the former one. The 10 objects were not in a definite arrangement but were mixed up thoroughly each test.

The mean performance for all left hands was 40.1 seconds with a sigma of 14.6 and with an average error of 0.2; this mean for right hands was 40.2 seconds with a sigma of 14.3 and with an average error of 0.1. In the group 48% were quicker with the left and 48% with the right. The average saving for those preferring the left was 11.4 and for those preferring the right 11.2. This test gave little differentiation between the hands.

From the standpoint of sex difference the mean for the left hands of men was 41.6 seconds with a sigma of 13.7 and with an average error of 0.3; this mean for women was 38.7 seconds with a sigma of 15.2 and with an average error of 0.1. The mean for the right hands of men was 39.1 seconds with a sigma of 14.6 and with an average error of 0.1; this mean for women was 41.4 seconds with a sigma of 14.0 and with an average error of 0.1. In terms of the quicker performance 38% of the men and 58% of the women were swifter with the left while 60% of the men and 36% of women were quicker with the right. The average saving for men with the left was 10.5 and for women 12.0 seconds while the average saving for men's right hands was 10.8 and for women 12.0. On this test men continued a slight fairly consistent preference for the right hand but women showed preference for the left hand in speed and preference.

The third test for the hands was very difficult. The sizes of the corks differed so little that they were kept colored that the experimenter in the necessary swift sorting would not be confused. The height and diameters of the corks differed one-sixteenth of an inch. Subjects used two methods of discrimination either a comparison of total volume or careful measurement of diameters.

TABLE IX. The Number and Per Cent of Cases with a Quicker Performance with the Left and Right Side on Sensory and Motor Tests.

Test	Left						Right						Equal					
	Men		Women		Total		Men		Women		Total		Men		Women		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sensory foot tests:																		
1. Marbles	30	60	24	48	54	54	20	40	25	50	45	45	0	0	1	2	1	1
2. Cubes	20	40	22	44	42	42	30	60	28	56	58	58	0	0	0	0	0	0
3. Corks	24	48	28	56	52	52	24	48	22	44	46	46	2	4	0	0	2	2
Average		49		49		49		49		50		50		1		1		1
Sensory hand tests:																		
1. Marbles	17	34	23	46	40	40	25	50	27	54	52	52	8	16	0	0	8	8
2. Cubes	19	38	29	58	48	48	30	60	18	36	48	48	1	2	3	6	4	4
3. Corks	28	56	24	48	52	52	21	42	24	48	45	45	1	2	2	4	3	3
Average		43		51		47		51		46		48		7		3		5
Motor foot tests without vision:																		
1. Grasping-carrying	27	54	21	42	48	48	23	46	27	54	50	50	0	0	2	4	2	2
2. Cross-movement	10	20	16	32	26	26	17	34	18	36	35	35	23	46	16	32	39	39
3. Manipulation	19	38	13	26	32	32	31	62	37	74	68	68	0	0	0	0	0	0
Average		37		33		35		44		55		51		15		12		13
Motor foot tests with vision:																		
1. Grasping-carrying	23	46	18	36	41	41	24	48	31	62	55	55	3	6	1	2	4	4
2. Cross-movement	5	10	12	24	17	17	17	34	16	32	33	33	28	56	22	44	50	50
3. Manipulation	11	22	15	30	26	26	38	76	33	66	71	71	1	2	2	4	3	3
Average		26		30		28		53		53		53		21		17		19

TABLE IX (Cont.)

Motor hand tests without vision:																		
1. Grasping-carrying	28	56	20	40	48	48	22	44	27	54	49	49	0	0	3	6	3	3
2. Cross-movement	6	12	12	24	18	18	25	50	17	34	42	42	19	38	21	42	40	40
3. Manipulation	18	36	17	34	35	35	30	60	32	64	62	62	2	4	1	2	3	3
Average		35		33		33		51		51		51		14		17		15
Motor hand tests with vision:																		
1. Grasping-carrying	24	48	21	42	45	45	21	42	25	50	46	46	5	10	4	8	9	9
2. Cross-movement	8	16	12	24	20	20	15	30	12	24	27	27	27	54	26	52	53	53
3. Manipulation	21	42	19	38	40	40	25	50	25	50	50	50	4	8	6	12	10	10
Average		35		35		35		41		41		41		24		24		24

The mean performance for all left hands was 95.3 seconds with a sigma of 48.2 seconds and with an average error of 1.9. The mean for the right hands was 95.4 seconds with a sigma of 51.7 and with an average error of 1.9. Of the group 52% preferred the left and 45%, the right hand. In terms of seconds saved by the preferred hand the left averaged 23.6 seconds and the right 27.1 seconds. There was no clear difference for either hand on this test.

As far as sex differences were concerned the mean for the left hands of men was 92.8 seconds with a sigma of 46.2 and with an average error of 2.8. The left mean for women was 97.8 seconds with a sigma of 49.9 and with an average error of 2.4. The mean for the right hand of men was 91.8 seconds with a sigma of 43.5 and with an average error of 1.9. This mean for women was 99.0 seconds with a sigma of 57.9 and with an average error of 2.4. In terms of the quicker performance 56% of men and 48% of women were quicker with the left; 42% of men and 48% of women were quicker with the right. The average saving for men with the left was 17.2 seconds and for women 31.1 seconds while the average saving for the right for men was 25.4 and for the women 28.5 seconds. The men made considerably less errors with the right hand with slight difference in time between the two hands. There were more men swifter with the left hand than the right but those preferring the right made a greater average saving. In time, error and preference there was little difference between the hands of women.

Several additional tests were given to about 30 students. Differentiation of the coarser of 16 paired sections of sandpaper gave no difference between the feet nor between the hands in time of performance. Another test without vision was the reading with the fingers of nonsense syllables made up of letters of the alphabet that might be read in either direction like A, H, T and Y. Heavy cord was stitched upon cardboard to form these letters which then appeared in raised form. Groups of 50 of these letters in syllable forms were read from both directions right to left and left to right. In reading from right to left both hands required about 30 seconds more time than in reading from left to right. No difference in errors appeared with the left hand in either direction but the right made considerably more errors in the right to left direction than the left to right. In

reading from right to left the left hand averaged 153 seconds for performance with 64% of the cases quicker with that hand. The right hand required 158 seconds for performance with only 36% of cases quicker with that hand. In this direction the left averaged 0.7 errors and the right 1.6. In the direction from left to right the left hand averaged 118 seconds with 71% of cases quicker with the left hand while the right averaged 124 seconds with only 29% quicker with the right. In the left to right direction the left averaged 0.7 errors and the right 1.2 errors. Even though only 30 cases were used, this test showed a clear advantage for the left hand in such reading even though students had had no practice. About one-third of this group were left-eyed on the cone and peephole test.

To summarize the sensory hand tests, some comparisons should be made. The means and midscores for the two hands of all cases differed about 2 seconds and sigmas differed less than 4. The average difference for total errors on the 3 hand sensory tests combined was 2.6 for the left and 2.1 for the right. The percent of preference was the same on the cube sorting test, 12% more for the right on the marble sorting test and 7% more for the left on the cork test.

If the decrease or increase of the performance time of the third trial over the first trial be considered for all cases, the difference between the hands was slight. An average of the results of the three hand sensory tests showed the left hands decreased time in 60% of cases with an average decrease of 13.6 seconds; the left increased time in 32% of cases with an average increase of 10.5 seconds. The right hands decreased time in 58% of cases with an average decrease of 14.9 seconds; the right increased time in 38% of cases with an average increase of 11.3 seconds. Table XIII should be consulted.

The combined evidence of hand and foot sensory tests showed that the 6 means differed 6 seconds or less and that the 3 means favoring the right were slightly greater than the 3 favoring the left. Of the midscores 2 were about the same and 4 favored the right. In 3 tests the percent of preference favored the left and 2 the right. Sigma differed for the 2 sides less than 7 points with 3 differences for each side. On sensory tests right feet were very slightly quicker than left ones while on the hand tests the evidence was conflicting. It is unlikely that the undersides of the toes showed much difference in skin

thickening for either foot while the generally greater use of the right hand may have produced such a difference in the hands.

The sensory tests were interesting from another standpoint. The kind of differentiation required in these tests was little practiced by the average person. In these sensory tests the basic trends to lateral preference with a minimum of practice effects should be revealed. The feet revealed a slight right preference in means while the evidence from the hands was conflicting. No clear differentiation of lateral preference was found in sensory learning for either feet or hands.. Should the experimenter conclude that lateral preference, at least for sensory learning, was dependent upon practice rather than innate factors?

5. RESULTS OF MOTOR TESTS WITH AND WITHOUT VISION

Results of motor tests without vision in earlier work indicated the need of further study of the effect of lack of vision upon motor performance.

(1) Motor Tests of Feet With and Without Vision

The grasping-carrying or transfer test consisted of picking up and transferring 5 three-quarter inch marbles from one small dish to another one 12 inches away. This test differed from an earlier one in two ways. Five instead of 10 marbles were used to cut down experimental time. The two dishes were placed vertically instead of horizontally to eliminate any directional preference for the left foot on the practiced left to right direction.

Tables X, XI and XII should be consulted. Without vision the left mean for all cases on the grasping-carrying test was 43.4 seconds with a sigma of 23.3; the right mean was 43.0 with a sigma of 26.5. In the group 48% were swifter with the left and 50% with the right with the average seconds saved the same for both feet. When the subjects could not see, there was practically no difference between the feet. With vision the left mean was 26.3 with a sigma of 10.8 and the right mean was 24.2 with a sigma of 10.8. With vision 41% of cases preferred the left and 55% the right. The average saving for right feet was 9.1 seconds and for the left 7.2 seconds. With vision the right foot had a slight preference.

A comparison with the former test administered to 100 subjects with 10 marbles and with the dishes arranged horizontally showed a slight left preference with vision in this group. Their average performance time for the left was 57.7 seconds with a sigma of 35.2 and for the right 59.4 seconds with a sigma of 37.8. In this group 48% were quicker with the left and 47% with the right. The average saving for the left foot was 20.8 seconds and for the right 17.6 seconds.

Differences became more evident when the sexes were compared on this test. Without vision the mean performance of men's left feet was 44.2 seconds with a sigma of 20.9 and the right 48.6 seconds with a sigma of 34.0. Of the male group 54% preferred the left and 46% the right with the greater saving in the left foot. Without vision the mean performance of women's left feet was 42.6 seconds with a sigma of 26.0 and the right 37.5 seconds with a sigma of 14.2. Of the female group 42% preferred the left and 54% the right with the greater saving in the right side. Without vision there was a small but clear advantage for the left feet of men on this test and for the right feet of women.

Did this relationship hold with vision? For men the mean left performance was 27.0 seconds with a sigma of 17.0 and for the right 26.4 seconds with a sigma of 14.1. Of the male group 46% preferred the left and 48% the right with a slightly greater saving in the right foot. With vision the mean left performance of women was 25.5 seconds with a sigma of 11.5 and for the right 21.9 seconds with a sigma of 7.1. Of the female group 36% preferred the left and 62% the right with the greater saving in the right foot. With vision men showed practically no difference between the feet, that is, they shifted from a slight left advantage toward a right advantage. With vision women increased slightly the right preference. For both sexes vision in this test tended to increase preferential use of the right foot.

What sex differences existed on the original test with 10 marbles, with the dishes in the horizontal direction and with vision? The left mean for men was 61.4 seconds with a sigma of 41.7 seconds and the right mean was 54.8 seconds with a sigma of 30.1. Of the male group 40% were better with the left and 54% with the right with

TABLE X.

Performance Time in Seconds for Men on the Motor Foot Tests with and without Vision.

No. of subject	Without Vision						With Vision					
	Grasping-carrying		Cross movement		Manipulation		Grasping-carrying		Cross movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
1.	55	134	21	21	84	93	42	60	14	13	63	42
2.	82	91	16	18	372	253	45	51	10	10	107	98
3.	50	33	23	19	217	222	20	17	11	10	45	40
4.	28	41	13	13	50	66	26	15	8	8	31	23
5.	64	49	18	16	144	139	45	39	10	9	62	81
6.	47	38	18	14	261	165	22	22	7	8	33	37
7.	19	17	9	9	58	91	12	12	6	6	24	20
8.	49	50	11	11	84	48	17	28	6	7	30	21
9.	62	51	19	19	103	144	46	39	12	12	50	33
10.	34	35	11	12	75	96	31	39	7	7	28	82
11.	38	24	17	16	86	118	15	13	10	10	26	20
12.	37	29	7	7	81	63	17	11	6	5	50	27
13.	26	42	13	13	77	32	18	14	10	10	25	23
14.	100	88	10	10	125	108	119	50	6	6	49	39
15.	24	17	8	7	51	29	15	17	6	6	18	16
16.	54	31	14	13	58	86	21	41	12	12	49	35
17.	54	111	20	19	54	117	26	27	10	10	36	42
18.	48	36	10	9	74	88	26	34	8	9	36	28
19.	86	87	21	24	340	234	71	70	12	12	285	153
20.	28	40	11	11	315	74	13	15	9	8	57	52
21.	89	61	13	11	168	123	17	31	8	8	56	35
22.	28	53	9	9	125	81	15	28	8	8	38	64
23.	30	46	6	5	93	82	20	15	6	6	41	18
24.	44	45	7	8	53	108	25	38	6	6	19	25

23.	30	46	6	5	93	82	20	15	6	6	41	18
24.	44	45	7	8	53	108	25	38	6	6	19	25

TABLE X (Cont.)

25.	24	21	7	8	26	31	12	18	6	5	14	12
26.	71	51	6	7	77	83	38	27	7	6	38	30
27.	47	39	7	7	139	195	28	15	8	7	58	37
28.	21	29	7	7	78	58	18	18	7	4	35	23
29.	35	44	22	26	81	61	22	27	20	19	38	32
30.	61	39	10	10	59	50	36	27	8	8	30	19
31.	43	25	12	12	91	77	18	17	12	12	35	25
32.	41	42	7	7	215	195	32	29	6	6	43	29
33.	44	37	6	6	84	63	29	19	6	6	69	28
34.	38	59	14	12	55	107	27	48	8	8	49	38
35.	82	56	8	8	104	155	33	29	6	6	57	45
36.	39	55	16	13	139	198	33	32	9	8	48	80
37.	39	81	6	6	183	159	13	18	4	4	32	31
38.	35	39	12	12	104	108	26	28	10	8	64	55
39.	54	29	13	11	80	77	29	12	12	12	46	27
40.	28	44	8	8	139	100	16	20	7	6	28	24
41.	35	28	7	7	157	122	26	16	6	6	40	36
42.	16	20	14	14	253	76	10	11	12	11	42	26
43.	31	19	8	9	207	44	22	16	7	7	66	28
44.	80	217	11	11	281	272	36	41	8	8	24	42
45.	32	37	11	9	97	60	15	27	8	8	34	37
46.	23	24	7	7	65	81	19	17	4	4	27	31
47.	27	45	11	10	174	75	18	27	7	7	25	28
48.	23	29	6	6	102	100	24	28	5	4	48	48
49.	28	25	7	6	118	68	22	14	6	6	42	28
50.	39	47	9	10	133	114	26	15	8	8	52	48
Average	44.2	48.6	11.6	11.3	127.8	107.8	27.0	26.4	8.3	8.0	46.8	38.8

TABLE XI.

Performance Time in Seconds for Women on the Motor Foot Tests with and without Vision.

No. of subject	Without Vision						With Vision					
	Grasping-carrying		Cross movement		Manipulation		Grasping-carrying		Cross movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
51.	25	26	26	22	68	67	21	19	15	15	50	44
52.	24	32	33	27	60	122	32	21	21	16	34	59
53.	37	53	19	22	93	28	19	20	11	10	27	16
54.	36	20	14	14	67	61	28	24	13	13	40	44
55.	56	51	27	27	103	75	25	33	13	14	31	35
56.	31	49	21	28	77	71	48	42	11	12	35	32
57.	60	33	16	18	78	66	23	21	13	12	32	25
58.	53	65	13	14	63	197	25	38	10	10	30	26
59.	125	76	27	26	218	565	42	39	12	11	53	82
60.	147	55	19	19	126	79	73	22	10	10	31	22
61.	25	31	12	13	73	52	26	28	11	11	29	38
62.	34	26	17	14	73	51	19	28	13	13	32	32
63.	38	33	22	21	56	55	24	21	13	12	40	28
64.	39	42	23	21	98	79	23	23	12	10	42	39
65.	35	30	18	20	347	165	25	22	10	9	54	34
66.	102	42	10	8	88	101	40	25	8	6	50	30
67.	38	46	11	10	79	69	21	29	7	8	21	30
68.	53	51	10	9	236	153	27	24	9	9	61	41
69.	35	41	12	12	58	75	17	35	11	11	37	36
70.	62	44	10	10	210	82	34	16	6	6	37	32
71.	48	56	10	13	128	77	26	22	8	8	44	38
72.	29	39	10	10	205	89	21	26	8	8	30	27
73.	65	31	10	10	97	49	17	23	7	6	33	21
74.	69	50	13	12	131	83	34	24	8	9	36	24

74.	69	50	13	12	131	83	34	24	8	9	36	24

TABLE XI (Cont.)

75.	60	46	11	12	86	52	47	27	7	8	35	25
76.	47	47	10	6	192	136	26	18	9	11	45	40
77.	32	48	10	9	115	51	17	19	10	8	21	24
78.	34	45	17	17	89	91	43	29	13	12	23	38
79.	54	49	7	8	136	163	26	32	7	8	56	70
80.	25	23	12	12	61	71	22	18	10	10	38	47
81.	55	39	10	9	93	58	18	21	8	8	32	31
82.	49	24	10	10	87	145	20	16	8	8	22	20
83.	26	19	6	6	67	180	22	13	4	4	31	39
84.	33	28	7	6	83	62	26	17	6	6	23	24
85.	14	37	14	15	48	33	22	17	12	12	25	14
86.	32	17	10	10	49	37	22	12	8	8	33	27
87.	16	21	9	11	28	20	15	10	8	8	23	19
88.	19	42	10	10	90	81	10	14	8	8	43	30
89.	18	12	8	7	38	41	23	19	6	6	23	17
90.	31	39	8	8	146	66	17	23	6	6	36	21
91.	26	22	11	10	76	45	16	10	10	10	27	22
92.	16	19	10	11	89	75	12	11	9	10	33	21
93.	31	36	18	20	241	140	16	18	10	11	28	23
94.	28	22	8	9	140	110	24	11	8	8	35	31
95.	52	78	9	9	246	292	23	26	7	6	46	47
96.	38	24	13	12	57	53	26	20	12	11	24	35
97.	24	24	10	10	126	107	18	10	7	8	37	25
98.	29	26	10	10	101	33	18	20	10	10	26	26
99.	27	32	18	17	64	100	15	21	13	11	28	37
100.	46	33	9	10	101	79	41	19	7	7	43	34
Average	42.6	37.5	13.6	13.5	109.6	96.6	25.5	21.9	9.7	9.4	34.9	32.4
Average for all	43.4	43.0	12.6	12.4	118.7	102.2	26.3	24.2	9.0	8.7	40.9	35.6

TABLE XII.

Comparison of Left and Right Feet and Hands of Subjects in Terms of Seconds Saved with the Preferred Member in Paired Trials on Motor Tests with and without Vision

	Without Vision									With Vision								
	Grasping-Carrying			Cross Movement			Manipulation			Grasping-Carrying			Cross Movement			Manipulation		
	R	L	E*	R	L	E	R	L	E	R	L	E	R	L	E	R	L	E
								Feet										
No. men	23	27	0	17	10	23	31	19	0	24	23	3	17	5	28	38	11	1
Average saving	13.4	19.5	.....	1.7	1.5	.....	50.5	29.8	.....	9.2	8.3	.....	1.1	0.8	.....	15.2	15.9	.....
No. women	27	21	2	18	15	17	37	13	0	31	18	1	15	12	23	33	15	2
Average saving	17.6	10.5	.....	1.8	1.8	.....	41.0	66.8	.....	9.1	5.8	.....	1.4	0.8	.....	8.3	10.1	.....
All cases	50	48	2	35	25	40	68	32	0	55	41	4	32	17	51	71	26	3
Average saving	15.7	15.6	.....	1.8	1.7	.....	45.3	44.8	.....	9.1	7.2	.....	1.3	0.8	.....	12.0	12.5	.....
								Hands										
No. men	22	28	0	24	6	20	30	18	2	21	24	5	15	7	28	25	21	4
Average saving	8.4	8.3	.....	1.3	1.0	.....	9.7	6.2	.....	5.4	3.8	.....	0.9	0.8	.....	3.7	2.5	.....
No. women	27	20	3	17	11	22	32	17	1	25	21	4	12	12	26	25	19	6
Average saving	8.0	6.6	.....	1.4	1.2	.....	10.3	8.8	.....	4.6	6.4	.....	0.8	1.0	.....	3.6	2.7	.....
All cases	49	48	3	41	17	42	62	35	3	46	45	9	27	19	54	50	40	10
Average saving	8.2	7.6	.....	1.3	1.1	.....	10.0	7.5	.....	5.0	5.0	.....	0.9	0.9	.....	3.7	2.6	.....

* Equal.

the greater saving of 7.4 seconds in the right foot. On this test the left mean for women was 54.1 seconds with a sigma of 26.7 and for the right 63.6 seconds with a sigma of 43.9. Of the female group 56% preferred the left and 40% the right with a much greater saving of 14.3 seconds in the left foot. In the original test for men evidence was conflicting with performance time and average saving favoring the right foot and with slightly more cases quicker with the left. Women, however, showed a striking advantage for the left foot in all ways. These relationships were very different from those in the test with vision and with the dishes in the vertical direction. The women of both groups were definitely right footed with two-thirds or more of the cases quicker with the right foot on the peg-board and tapping tests in the earlier tests and on the manipulation of marbles into the inverted bowl of this series. Two specific factors probably accounted for the variation of results. In the original test with the dishes placed horizontally and the marbles transferred from the dish nearest the performing foot, there was a directional preference for the left foot which moved from left to right. The more relaxed or weaker foot would probably carry more round objects than the stronger foot. The left feet of men were consistently quicker and stronger than women's left feet yet women averaged one less trip with their left feet than men on this test. This test was well worth studying in detail because it showed how readily rather small factors modify test results.

To test further this directional preference of movement in the horizontal plane without the complications of a task, subjects were asked to move the foot from one dish to the other in five trips for each test. The left foot moved from left to right and back while the right foot moved from right to left and back. This was done without and with vision. The movements were so quick that timing was difficult. For the entire group the left mean without vision was 12.6 seconds and for the right 12.4 seconds. For the group 26% were quicker with the left and 35% with the right while 39% gave about equal performance. While the mean differences were not great it was interesting that certain individuals showed from 1 to 6 seconds difference in this directional performance. For the entire group with vision the left mean was 9.0 and the right 8.7

* Equal.

seconds. For the group with vision 17% preferred the left and 33% the right with equal performance in 50% of the cases. The differences between the sexes were negligible. Vision decreased for both sexes the left preference and increased the numbers with equal performance.

The manipulation test was the same as in an earlier series except that only 5 marbles were picked up without vision from the tray and placed in the small hole of the inverted wooden bowl. This test showed a high right preference. For all cases the mean performance of the left foot without vision was 118.7 seconds with a sigma of 73.3 and the right was 102.2 seconds with a sigma of 71.8. For the group 32% were quicker with the left and 68% with the right. The average saving for the left was 44.8 and for the right 45.3.

What change did vision produce in this test for the group? The mean left performance was 40.9 seconds with a sigma of 13.4 and for the right 35.6 seconds with a sigma of 19.9. For the group 26% were quicker with the left and 71% with the right foot. The average left saving was 12.5 and for the right 12.0. Lack of vision seemed to exaggerate differences between the sides while vision tended to shift left preferences toward the right.

How did the performance of this group of 90 students compare with the former group of 100 on the same test but with twice as many marbles? The mean left performance for the earlier group was 216.0 seconds with a sigma of 104.2 and the right was 181.0 seconds with a sigma of 80.5. Of the entire group 33% were quicker with the left and 67% with the right. The average saving for those with left preference was 43.7 seconds and for those with the right preference 74.4 seconds. With two entirely different groups the per cent of preference was practically the same. Continuing the task with 5 more marbles increased the difference between sides significantly. With 5 marbles the difference between sides was only 16 seconds; with 10 marbles the difference became 77 seconds. The weaker foot fatigued rapidly and that repetition of activity increased the reliability of the test.

Both sexes showed fairly definite right preference on this test. Without vision the left mean for males was 127.8 seconds with a sigma of 80.2 and the right 107.8 with a sigma of 57.3. For this

group 38% preferred the left and 62% the right foot. The left foot averaged a saving of 29.8 seconds while the right averaged 50.5 seconds. Without vision the left mean for women was 109.6 seconds with a sigma of 64.4 and the right mean was 96.6 seconds with a sigma of 83.5. Of the women 26% were quicker with the left and 74% with the right. The average saving for the women's left was 66.8 seconds and for the right 41.0 seconds.

What effect had vision upon this test for sex differences? With vision the left mean for men was 46.8 seconds with a sigma of 37.7 and the right 38.8 with a sigma of 24.7. Of the men 22% were quicker with the left and 76% with the right with the average saving about the same for both feet. The left mean for women with vision was 34.9 seconds with a sigma of 10.1 and the right mean was 32.4 seconds with a sigma of 12.9. Of the women 30% were quicker with the left and 66% with the right with the average saving slightly greater in the left foot. Both sexes showed a definite right preference in this test with vision but the difference between the two sides in mean performance was decreased with vision. Performance time and variability were both decreased with vision.

In this test on the early series the mean for the left feet of men was 229.2 seconds with a sigma of 127.3 and the right mean was 198.6 with a sigma of 93.3. In this group 36% preferred the left and 64% the right. The average saving for the left was 44.5 and for the right 72.0. The left mean for women on the early series was 202.9 seconds with a sigma of 74.5 and the right mean was 163.4 with a sigma of 60.9. Of the women 31% favored the left foot and 69% the right. The average left saving was 42.8 seconds and for the right 76.5 seconds. The results of the first test were similar to those of the later group as far as general differentiation of sides was concerned. The percentages of preference for the left and right feet were remarkably similar. With 5 marbles the means for men differed 20 seconds and for women 13. With 10 marbles means for men differed 31 seconds and for women 40 seconds. Using more marbles with the accompanying fatigue factor, increased differentiation of sides.

After the experimentation got under way it was found that there was time for an additional test. The manipulation test with locks

was used. The mean left performance for all 71 cases was 67.5 seconds and the right 69.2 seconds. The women showed little difference in mean time of performance and in per cent of preference. Men's left feet averaged 69.3 with 57.9% of cases quicker with the left. Men's right feet averaged 72.1 seconds in performance time with 36.8% of cases preferring the right.

As a summary to the section on motor foot tests with and without vision, certain general trends should be stated. In the first place sigma was greatly increased without vision, especially for the left foot. The left sigma as Table VIII shows, averaged for the three foot tests without vision 46.8 and with vision 9.8 while the right without vision was 34.9 and with vision 11.9. In the second place, without vision mean performance time was greatly increased. The left mean on the three tests without vision averaged 58.2 and with vision 25.4 while the right mean without vision averaged 52.5 and with vision 22.8. In the third place, the difference between the left and right side was greater without vision than with vision. Without vision the difference between the sides on the basis of the average of the three means was 5.7 while the difference with vision was 2.6. The difference between sides on the more difficult manipulation test without vision was 16.5 seconds and with vision 5.3 seconds. In the fourth place, vision tended to increase the percent of cases with equal performance and to shift the group toward a right preference, more evident in the difficult test. The average for the percent of preference on the three tests without vision was 35% left, 51% right and 13% equal while with vision this became 28% left, 53% right and 19% equal. For the more difficult manipulation test without vision the percent of preference was 32% left, 68% right and 0% equal while with vision this became 26% left, 71% right and 3% equal. On the three tests without vision the difference between the left and right percent of preference averaged 15.6 more for the right while with vision this became 25.0 more for the right. In the fifth place, the right foot was favored without vision if the decrease or increase in performance time of the third over the first trial be considered. For this comparison listed in Table XIII only 2 tests were used since differences in the cross movement were so small. With the left foot without vision 70% of cases

The Percent of Cases and Average Amount of Decrease and Increase of Performance Time from the First to the Third Trial for the Left and Right Side on Motor and Sensory Tests

The Percent of Cases and Average Amount of Decrease and Increase of Performance Time from the First to the Third Trial for the Left and Right Side on Motor and Sensory Tests

Test	Left														
	Men					Women					Total				
	Decrease		Increase		Equal	Decrease		Increase		Equal	Decrease		Increase		Equal
	%	Amt.	%	Amt.	%	%	Amt.	%	Amt.	%	%	Amt.	%	Amt.	%
Sensory foot tests:															
1. Marbles	62	14.0	36	14.1	2	76	17.6	22	7.6	2	69	15.9	29	11.6	2
2. Cubes	66	17.8	34	12.7	0	62	23.8	38	22.7	0	64	20.7	36	17.9	0
3. Corks	64	24.2	36	18.7	0	66	27.7	30	17.5	4	65	25.9	33	18.2	2
Average	64	18.6	35	15.2	1	68	23.3	30	15.9	2	66	20.8	33	15.9	1
Sensory hand tests:															
1. Marbles	54	7.2	34	4.4	12	52	8.0	38	5.7	10	53	7.6	36	5.1	11
2. Cubes	56	7.8	34	7.9	10	74	8.2	22	6.9	4	65	8.1	28	7.5	7
3. Corks	64	28.9	30	20.9	6	62	21.5	36	17.5	2	63	25.3	33	19.0	4
Average	58	14.6	33	11.1	9	63	12.6	32	10.0	5	60	13.6	32	10.5	7
Motor foot tests without vision:															
1. G-Carry	60	13.1	38	6.1	2	76	14.6	20	15.2	4	68	13.9	29	9.2	3
2. Manipulation	70	71.7	28	27.0	2	72	53.6	28	19.4	0	71	62.5	28	23.3	1
Average	65	42.4	33	16.5	2	74	34.1	24	17.3	2	70	38.2	29	16.2	2
Motor foot tests with vision:															
1. G-Carry	64	5.3	30	5.9	6	52	6.2	36	5.2	12	58	5.7	33	5.5	9
2. Manipulation	74	8.8	20	9.4	6	64	7.2	26	4.8	10	69	8.0	23	6.8	8
Average	69	7.1	25	7.7	6	58	6.7	31	5.0	11	64	6.9	28	6.2	9
Motor hand tests without vision:															
1. G-Carry	82	5.6	16	4.1	2	76	7.6	18	3.6	6	79	6.5	17	3.8	4
2. Manipulation	74	10.0	18	5.3	8	72	8.7	24	7.4	4	73	9.4	21	6.5	6
Average	78	7.8	17	4.7	5	74	8.2	21	5.5	5	76	8.0	19	5.1	5
Motor hand tests with vision:															
1. G-Carry	54	3.3	32	2.6	14	48	3.2	38	2.4	14	51	3.2	35	2.5	14
2. Manipulation	72	2.4	14	2.4	14	46	2.3	30	2.2	24	59	2.4	22	2.3	19
Average	63	2.9	23	2.5	14	47	2.8	34	2.3	19	55	2.8	29	2.4	17

TABLE XIII—Continued

Test	Right														
	Men					Women					Total				
	Decrease		Increase		Equal	Decrease		Increase		Equal	Decrease		Increase		Equal
	%	Amt.	%	Amt.	%	%	Amt.	%	Amt.	%	%	Amt.	%	Amt.	%
Sensory foot tests:															
1. Marbles	64	20.1	34	12.9	2	70	20.6	30	6.7	0	67	20.3	32	9.9	1
2. Cubes	54	27.3	42	19.5	4	70	29.3	26	27.3	4	62	28.4	34	22.5	4
3. Corks	64	27.3	36	15.1	0	62	22.3	34	11.8	4	63	24.8	35	13.5	2
Average	60	24.9	37	15.8	2	67	24.1	30	15.3	3	64	24.5	34	15.3	2
Sensory hand tests:															
1. Marbles	58	8.8	36	4.7	6	64	8.3	34	5.3	2	61	8.5	35	5.0	4
2. Cubes	60	8.9	34	9.7	6	58	8.8	38	10.8	4	59	8.8	36	10.3	5
3. Corks	54	27.6	44	17.7	2	56	27.5	42	20.8	2	55	27.5	43	19.2	2
Average	57	15.1	38	10.7	5	59	14.9	38	12.3	3	58	14.9	38	11.3	4
Motor foot tests without vision:															
1. G-Carry	76	18.0	24	12.3	0	82	15.0	14	9.3	4	79	16.4	19	11.2	2
2. Manipulation	82	50.6	16	21.4	0	82	38.1	16	4.3	2	83	44.4	16	12.8	1
Average	79	34.3	20	16.9	0	82	26.5	15	6.8	3	81	30.4	18	12.0	2
Motor foot tests with vision:															
1. G-Carry	58	5.2	38	4.7	4	56	4.0	32	4.9	12	57	4.6	35	4.8	8
2. Manipulation	68	9.0	28	5.4	4	66	8.2	32	4.8	2	67	8.6	30	5.1	3
Average	63	7.1	33	5.1	4	61	6.1	32	4.9	7	62	6.6	33	5.0	6
Motor hand tests without vision:															
1. G-Carry	70	6.0	26	4.9	4	86	6.1	10	2.2	4	78	6.0	18	4.1	4
2. Manipulation	82	10.8	12	5.8	6	60	8.3	34	3.4	6	71	9.8	23	4.0	6
Average	76	8.4	19	5.3	5	73	7.2	22	2.8	5	75	7.9	21	4.0	5
Motor hand tests with vision:															
1. G-Carry	60	3.3	36	2.3	4	34	2.1	42	2.8	24	47	2.9	39	2.6	14
2. Manipulation	64	3.0	14	2.4	14	58	2.9	28	1.4	14	61	3.0	26	1.9	13
Average	62	3.2	25	2.4	9	46	2.5	35	2.1	19	54	3.0	33	2.3	14

decreased time with an average decrease of 38 seconds while 29% of the left feet increased time with the average increase of 16 seconds. With the right foot 81% of cases decreased time with the average decrease of 30 seconds while only 18% of the cases increased the time with the average increase of 12 seconds. With vision the left foot decreased time in 64% of cases and the right in 62%. The left foot made a fairly good showing in this comparison. In the sixth place, vision tended to produce more shortest trials that were either equal or shifted to the right side. As Table XIV shows, the average for the shortest trials on the two tests compared without vision, was 46% left, 50% right and 5% equal while with vision this became 36% left, 54% right and 11% equal.

Were any sex differences to be noticed in performance with and without vision? In the first place, sigma was increased more for women than men with both feet without vision. On the three tests without vision as compared to these with vision the average of sigma for the left foot decreased 16. points for men and 23. points for women while the average for sigma for the right foot decreased 18. points for men and 26.5 for women. In the second place, lack of vision increased the time of performance more for men than women. Without vision men's average of left means was 5.9 points greater than women's average for left means while with vision men's left average was 4.0 greater than women's. Without vision men's average of right means was 6.7 more than women's while with vision this average was 3.2 greater than women's. On the more difficult manipulation test without vision men's left mean was 18. seconds more than women's and with vision 11.9. Without vision men's right mean on this test was 11.2 seconds more than women's and with vision 6.4 seconds more.

In the third place lack of vision exaggerated the difference between sides somewhat more for women than men on the basis of the average of the 3 means. Without vision men showed 5.3 seconds between sides and with vision 3.0 while women without vision showed 6.1 seconds between sides and with vision 2.3 seconds.

In the fourth place vision shifted the percent of preference toward the right side with greater equality of performance somewhat more in the case of men than women. Without vision men showed on

1. O'Carry																								
2. Manipulation	64	3.0	14	25	2.4	9	46	2.5	35	2.1	19	54	3.0	33	2.3	14	62	3.2	25	2.4	14	58	2.9	28	1.4	14	61	3.0	26	1.9	13
Average																														

TABLE XIV.

Percent of Lateral Preference in Terms of Shortest Trial on Tests

Test	Left			Right			Equal		
	Men	Wom.	Total	Men	Wom.	Total	Men	Wom.	Total
Sensory foot tests:									
1. Marbles	56	38	47	42	56	49	2	6	4
2. Cubes	36	40	38	52	58	55	12	2	7
3. Corks	48	62	55	46	36	41	6	2	4
Average	47	47	47	47	50	48	7	3	5
Sensory hand tests:									
1. Marbles	40	40	40	52	44	48	8	16	12
2. Cubes	40	40	40	40	48	44	20	12	16
3. Corks	52	52	52	42	40	41	6	8	7
Average	44	44	44	45	44	44	11	12	12
Motor foot tests without vision:									
1. Grasping-C.	60	38	49	34	50	42	6	12	9
3. Manipulation	42	42	42	56	58	57	2	0	1
Average	51	40	46	45	54	50	4	6	5
Motor foot tests with vision:									
1. Grasping-C.	38	30	34	42	58	50	20	12	16
3. Manipulation	32	42	37	62	52	57	6	6	6
Average	35	36	36	52	55	54	13	9	11
Motor hand tests without vision:									
1. Grasping-C.	40	44	42	52	46	49	8	10	9
3. Manipulation	36	40	38	62	50	56	2	10	6
Average	38	42	40	57	48	53	5	10	8
Motor hand tests with vision:									
1. Grasping-C	38	36	37	46	46	46	16	18	17
3. Manipulation	32	32	32	50	46	48	18	22	20
Average	35	34	35	48	46	47	17	20	19

foot tests 37% left, 44% right and 15% equal preferences while with vision they had 26% left, 53% right and 21% equal preference. Table IX should be consulted. Without vision women showed 33% left, 55% right and 12% equal preference and with vision 30% left, 53% right and 17% equal. Without vision women averaged a difference of 21. for the right in percent of preference and with vision 23. while men without vision averaged a difference of 13. for the right and with vision 27. for the right. Vision significantly increased the number of men who were quicker with the right foot.

In the fifth place, the percent of cases showing decreased time from first to last performance showed that both sexes without vision had greater rate of decrease on the right side with more difference for men than women. With vision both sides had about the same percent of decrease on the right side but with the left side men showed a greater percent of decrease than women. Without vision men showed decreased time for 65% of left feet and 79% right feet while with vision they had 69% decrease of left feet and 63% decrease of right feet. Without vision women had 74% decrease in the left foot and 82% in the right while with vision they had 58% decrease in the left and 61% right decrease.

In the sixth place, lack of vision decreased the percent of shortest trials on the left side for both sexes, more for men than women. Without vision men had 51% left, 45% right and 4% equal shortest trials according to Table XIV while with vision they had 35% left, 52% right and 13% equal. Without vision women had 40% left, 54% right and 6% equal while with vision they had 36% left, 55% right and 9% equal shortest trials.

(2) Motor Tests of Hands With and Without Vision

For comparative purposes hand tests were selected similar to the foot ones. They were given with and without vision. In the first hand test 20 ball bearings about 3/16 of an inch in diameter were transferred from one dish to another one in a vertical plane. The dishes were the same as those used for the foot test of grasping and carrying. With the hand test the dishes were tipped slightly so the ball bearings would collect on one side of the dish. This proved to be a poor test of handedness since minor factors greatly affected results. Without vision the left and right means were both 36 seconds with a sigma of 12. In the group 48% were swifter with the left with an average saving of 7.6 seconds and 49% with the right hand with an average saving of 8.2 seconds. With vision the means were the same for both hands with sigma slightly greater for the left hand. Means with vision were 13 seconds less than without vision. With vision 45% of the cases were swifter with the left and 46% with the right with an average saving of 5 seconds for both hands.

As far as sex differences were concerned without vision there was no difference for men between the sides while women were very slightly swifter and less variable with the right hand. The sexes presented a reversal of preference. Of the men 56% were quicker with the left and 44% with the right with the average saving the same for both hands. Of the women 40% were swifter with the left and 54% with the right hand which also had slightly greater saving. With vision the means for both sexes were the same and both showed slightly greater variability in the right hand.

In the earlier series a similar test without vision was given in which subjects transferred 100 ball bearings from one dish to another in the horizontal plane. For all cases the mean performance for both hands was the same with 51% of cases quicker with the left and 47% with the right. In this earlier test the left mean for men was 88.1 seconds with a sigma of 46.1 and the right 82.2 with a sigma of 37.9. Of the men 40% were better with the left and 56% with the right with the greater saving in the right hand. On the early test women had a left mean of 71.6 seconds with a sigma of 22.5 and a right mean of 75.4 seconds with a sigma of 23.7. Of the women 61% were better with the left and 39% with the right with the average saving about the same for both. On this early test men showed a definite right preference while women showed a definite left preference. While the men showed little difference in the number of trips for either hand, the women showed in two-thirds of the cases significantly less trips with the left hand. The more relaxed left hand of women probably carried more round objects.

The cross-movement hand test was the same as for feet. The time element involved in the task was more difficult to measure with the hands than with the feet. For the entire group without vision the right mean was slightly less than the left. Of the group 18% were quicker with the left hand and 42% with the right hand with no difference in 40% of cases. There was slightly more saving in case of the right hand. With vision the means were the same. With vision 20% were quicker with the left and 27% with the right, with no difference in 53% of cases. Vision tended to minimize differences between the hands. Were there any noticeable sex differences in this test? The factor of vision seemed to be more import-

TABLE XV.

TABLE XV.

Performance Time in Seconds for Men on the Motor Hand Tests with and without Vision

No. of Subject	Without Vision						With Vision					
	Grasping-Carrying		Cross Movement		Manipulation		Grasping-Carrying		Cross Movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
1.	41	39	14	14	60	58	20	29	11	12	19	23
2.	36	45	14	13	71	74	29	24	10	10	30	29
3.	54	68	13	11	55	59	30	32	10	9	22	20
4.	23	22	8	8	33	39	15	16	7	6	16	17
5.	38	40	9	8	48	51	23	17	7	7	21	19
6.	40	34	15	11	50	45	30	29	6	6	24	20
7.	35	36	13	12	49	39	14	16	5	4	14	17
8.	27	31	4	4	42	42	14	20	3	3	13	15
9.	37	45	8	8	52	50	22	25	8	8	33	28
10.	47	57	5	3	46	61	21	22	3	3	21	25
11.	16	17	11	10	45	35	12	11	10	10	24	20
12.	8	16	4	4	52	44	4	6	4	4	18	17
13.	40	39	5	5	40	41	21	22	4	5	17	15
14.	40	44	6	5	55	51	29	20	5	5	25	20
15.	15	23	4	4	27	39	20	22	4	4	19	15
16.	33	42	10	9	38	37	26	29	9	8	23	23
17.	36	44	6	7	80	50	30	26	6	6	25	27
18.	34	22	9	9	38	42	11	12	8	8	17	21
19.	28	85	8	7	66	66	27	37	5	5	30	31
20.	39	42	6	6	51	47	27	27	8	7	26	23
21.	36	41	9	8	70	49	29	24	6	6	21	20
22.	31	20	4	5	44	42	18	18	5	5	18	20
23.	41	28	5	4	46	37	20	26	5	4	18	16
24.	21	17	5	4	49	55	14	14	3	4	25	22

TABLE XV (Cont.)

No. of Subject	Without Vision						With Vision					
	Grasping-Carrying		Cross Movement		Manipulation		Grasping-Carrying		Cross Movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
25.	20	16	3	3	59	29	15	10	3	3	15	16
26.	28	30	5	5	39	36	19	19	3	4	28	19
27.	42	48	6	5	68	62	23	31	5	6	26	21
28.	29	24	2	3	33	37	26	30	4	3	17	22
29.	49	36	19	16	62	57	33	27	12	12	27	27
30.	33	37	6	6	37	38	20	23	6	6	21	24
31.	41	40	10	10	68	35	34	31	10	10	23	24
32.	27	30	5	5	58	43	19	20	4	3	34	23
33.	30	27	4	4	30	29	16	17	4	4	10	13
34.	37	42	8	8	55	46	24	20	6	6	22	18
35.	39	29	4	3	50	35	32	19	2	2	21	21
36.	59	35	8	7	81	50	37	30	6	5	33	32
37.	29	43	4	4	47	48	17	23	4	4	20	22
38.	52	43	8	7	56	37	36	31	7	6	24	29
39.	80	61	8	8	45	41	38	32	6	6	25	21
40.	38	30	5	5	46	64	17	17	4	4	19	18
41.	33	45	5	5	41	52	22	33	4	5	18	19
42.	31	39	10	10	44	39	30	27	9	9	22	19
43.	25	26	6	4	27	25	18	16	5	5	21	15
44.	43	37	5	7	53	59	19	22	5	5	17	22
45.	52	36	7	5	48	45	34	27	4	4	26	23
46.	27	32	4	4	34	45	20	16	3	3	23	24
47.	49	38	6	6	34	38	22	26	5	4	23	16
48.	35	29	4	4	62	61	31	24	5	5	22	22
49.	31	42	5	4	37	39	25	15	4	4	20	22
50.	45	55	9	8	53	52	31	33	7	6	27	28
Average	36.0	36.9	7.3	6.8	49.5	45.9	23.3	22.9	5.8	5.7	22.1	21.3

ant in the case of men. Without vision men showed a greater difference between hands than in the case of women. Without vision men were quicker with left in 12% of cases and with the right in 50% of cases while women were quicker with left in 24% of cases and with the right in 34% of cases. With vision men were quicker with left in 16% of cases and with the right in 30% of cases while women had 24% of cases quicker for both left and right.

The manipulation hand test resembled greatly the foot manipulation test. A convex cover 3 inches in diameter had a very small hole in the center. This cover was placed against the bottom of a small tin plate 6 inches in diameter. Ten 3/16 inch ball bearings were placed in the tin plate which was held on an inclined plane so the ball bearings were on the side toward the subject. Subjects placed these 10 bearings into the small central hole of the cover with and without vision. For all cases without vision the left mean was 49.5 seconds with a sigma of 12.2 and the right was 45.9 seconds with a sigma of 11.4. In this group 35% were quicker with the left and 62% with the right with the average saving the same for both hands. With vision the left mean was 21.4 with a sigma of 5.6 and the right mean 20.6 with a sigma of 5.2. With vision 40% of the group were quicker with the left and 50% with the right with no difference in 10% of cases. The average saving for the left was 2.6 seconds and for the right 3.7 seconds. Vision tended to equalize the performance of the two hands with less difference in mean performance and percent of preference.

For comparative purposes it was interesting to observe the similarity of the group in foot and hand performance on this test. There was much greater difference between the feet in performance time and percent of preference without vision than between hands without vision. Without vision about two-thirds of the group were quicker with both the right feet and the right hands. Vision shifted the percent of preference toward the right in the case of feet and produced more equality of performance in the case of the hands.

What sex differences were shown on the manipulation hand test? Without vision both men and women gave similar hand performances with the right hand quicker by 3.5 seconds in mean performance. With vision both sexes showed the right hand quicker by about

TABLE XVI.

Performance Time in Seconds for Women on the Motor Hand Tests with and without Vision

No. of Subject	Without Vision						With Vision					
	Grasping-Carrying		Cross Movement		Manipulation		Grasping-Carrying		Cross Movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
51.	35	35	5	4	51	47	25	29	8	6	23	17
52.	45	37	12	15	56	42	44	29	11	11	25	20
53.	71	55	14	12	41	45	21	54	9	8	18	21
54.	31	36	9	10	58	74	21	26	8	8	19	20
55.	48	46	17	17	68	61	35	35	10	10	23	21
56.	30	27	12	10	35	36	25	24	8	8	12	14
57.	24	25	15	15	43	52	18	14	9	10	21	18
58.	28	26	11	8	52	52	17	27	7	9	24	24
59.	29	22	8	10	44	72	19	16	8	8	22	22
60.	26	18	10	9	55	41	16	11	8	7	13	15
61.	50	54	11	11	44	69	36	30	8	9	20	18
62.	23	34	12	11	40	57	12	18	8	8	19	21
63.	28	36	13	12	32	30	15	23	8	10	18	15
64.	42	42	17	17	63	50	32	25	12	11	25	25
65.	32	50	15	16	61	62	22	28	11	10	27	23
66.	33	39	6	6	42	38	18	28	4	4	19	13
67.	16	16	5	4	48	42	13	11	4	3	21	18
68.	72	45	10	10	58	47	42	34	8	9	25	28
69.	27	23	10	9	48	31	15	12	8	8	26	21
70.	47	37	8	7	30	37	34	25	6	6	20	15
71.	33	32	8	6	36	38	20	27	6	6	16	20
72.	34	41	6	7	66	34	25	24	6	6	22	27
73.	24	32	5	4	55	48	20	22	4	4	18	22
74.	47	46	6	6	63	46	21	21	5	5	21	20

one second. Without vision both sexes showed preference for right hands in about two-thirds of the cases while with vision both sexes showed slight increase in left preferences, a decrease in right preferences and an increase in equality of preferences.

To summarize the section on motor hand tests with and without vision certain general trends should be noticed. In the first place according to Table VIII sigma for both hands increased without vision. The left sigma for the 3 tests without vision averaged 9.7 and with vision 5.7. The right sigma for the 3 tests without vision averaged 9.3 and with vision 5.2. In the second place mean performance time of hands was significantly increased without vision. The average for the 3 left means without vision was 30.9 and with vision 17.1 while the average for the 3 right means without vision was 29.8 and with vision 16.7. In the third place without vision there was slightly more difference between the left and right hands than with vision. Without vision the average of the 3 left means was 1.5 more than the average for the 3 right means. With vision the left average was only 0.3 more than the right average.

In the fourth place as Table IX shows, vision tended to decrease right preferences and increase equality of preferences in the group. Without vision the average percent of preference on the 3 tests was 33% left, 51% right and 15% equal while with vision the average percent was 35% left, 41% right and 24% equal. From Table IX the average of the differences in percent of preference for tests without vision was 17.3 for the right and with vision 6.0 for the right.

In the fifth place a comparison of saving of time between the first and third repetitions of tests on the two tests compared in Table XIII, showed no difference between the hands but time decreased without vision in more cases than with vision. An average of the two tests for all cases without vision showed the left hand decreasing performance time in 76% of cases and increasing it in 19% while the right hand decreased time in 75% of cases and increased it in 21% with the amounts of decrease and increase just about the same for both hands. An average of the two tests with vision showed the left decreasing time in 55% of cases and increasing it in 29% while the right decreased it in 54% and increased it in 33% with the amounts about the same for both hands.

TABLE XVI (Cont.)

No. of Subject	Without Vision						With Vision					
	Grasping-Carrying		Cross Movement		Manipulation		Grasping-Carrying		Cross Movement		Manipulation	
	L	R	L	R	L	R	L	R	L	R	L	R
75.	22	28	6	6	33	37	9	11	5	5	19	17
76.	54	60	7	6	34	38	36	22	6	5	23	19
77.	18	27	6	6	44	45	18	16	6	5	20	22
78.	44	45	12	14	73	44	24	31	10	10	26	27
79.	32	35	6	5	53	51	24	23	6	6	21	27
80.	42	49	9	8	45	34	27	25	8	8	18	21
81.	49	40	7	7	44	38	31	26	6	7	25	19
82.	37	35	6	6	53	45	16	15	5	5	19	14
83.	40	27	4	4	68	44	30	22	4	4	27	18
84.	38	37	5	5	43	39	17	23	4	4	18	20
85.	32	37	6	7	43	38	27	21	5	6	17	14
86.	30	23	5	4	29	35	15	15	4	3	19	20
87.	32	26	6	6	52	35	21	22	6	6	17	17
88.	38	30	6	6	56	46	19	27	4	4	21	21
89.	31	22	6	6	49	40	18	14	6	6	19	15
90.	51	29	6	6	57	50	23	24	5	5	24	21
91.	34	27	7	7	31	36	24	23	6	6	15	17
92.	52	46	6	6	47	50	29	28	6	6	25	24
93.	45	53	6	7	73	62	35	39	7	8	26	21
94.	24	22	8	8	53	42	15	15	6	6	16	16
95.	34	32	6	6	64	62	21	23	6	6	20	23
96.	38	23	7	7	51	47	20	16	6	6	14	17
97.	34	38	6	6	45	62	19	23	6	6	25	23
98.	38	47	9	9	41	40	31	29	8	9	22	21
99.	50	31	10	8	65	45	24	25	8	8	23	22
100.	21	27	6	6	47	38	13	20	6	6	18	20
Average	36.7	35.0	8.4	8.3	49.4	45.9	23.0	23.4	6.8	6.8	20.7	19.9
Average for all	36.4	36.0	7.9	7.5	49.5	45.9	23.2	23.1	6.3	6.3	21.4	20.0

In the sixth place according to Table XIV, the percent of shortest trials was decreased for both left and right hand with more cases of equality of shortest performance. Without vision shortest trials were 40% left, 53% right and 8% equal. With vision these became 35% left, 47% right and 19% equal. The more accurate manipulation test had without vision 38% left, 56% right and 6% equal while with vision these became 32% left, 48% right and 20% equal.

There were few sex differences in hand performance with and without vision. Sexes gave very similar responses on variability, mean performance, percent of preference and preference for shortest trials. The one difference noticeable was in percent of cases with decreased time from first to third repetitions in Table XIII. Without vision men showed 78% cases decreasing time with the left and 76% with the right while women had 74% decreasing with the left and 73% with the right. Responses without vision were similar but with vision not so many women decreased time as men. With vision men showed 63% cases decreasing time with the left and 62% with the right while women showed only 47% cases decreasing time with the left and 46% with the right. On the manipulation test men showed 72% cases decreasing with the left and 64% with the right while women had only 46% cases decreasing time with the left and 58% with the right. Since women showed this more in the left hand, perhaps fatigue explained the difference between the sexes on this point.

(3) Comparison of Foot and Hand Tests With and Without Vision

A comparison of foot and hand tests with and without vision gave some interesting differences. First, sigma for feet increased much more without vision than sigma for hands without vision. Without vision sigma for the left foot increased 37.0 points and for the left hand only 4.0. Sigma for the right foot increased 23.0 points and for the right hand 4.1. Sigma increased about the same amount for both hands without vision but the left foot showed a greater increase in sigma than the right foot. Secondly, without vision means for feet more than doubled while means for hands less than doubled. The

left average for the 3 foot means without vision increased 32.8 seconds and for the hands only 13.8 seconds. The right average for the 3 foot means increased 29.7 seconds and for the hands only 13.1 seconds. Lack of vision was slightly more detrimental to left foot performance than right while the hands did not show an unequal effect to any extent.

In the third place without vision the difference between the left and right side was exaggerated for both feet and hands on the basis of averages for the 3 tests. The right side was quicker for both feet and hands. The difference between the sides in feet without vision was 5.7 and with vision 2.6. The difference between sides in hands was 1.5 without vision and 0.3 with vision. In the fourth place vision for both feet and hands tended to produce similarity of performance for the two sides, perhaps slightly more for hands and feet, that is, on the basis of percent of preference. Vision in foot tests tended to increase the percent of right preferences. This was not noticeable in hand tests but the hand tests were significantly easier for hands than the foot tests for feet. Without vision foot preferences were 35% left, 51% right and 13% equal and with vision 28% left, 53% right and 19% equal. Without vision hand preferences were 33% left, 51% right and 15% equal and with vision 35% left, 41% right and 24% equal. The percent of preference for hands and feet without vision were remarkably similar.

In the fifth place, a comparison of decrease of performance time from first to third repetitions for feet and hands showed lack of vision was more favorable for decreasing time than vision for both hands and feet. Without vision the left foot decreased time in 70% of cases and the right foot in 81% while the left hand decreased time in 76% of cases and the right hand in 75%. With vision the left foot decreased time in 64% of cases and the right foot in 62% while the left hand decreased time in 55% of cases and the right hand in 54%. The right foot without vision showed more cases of decreased time than the left foot but there was no difference between the hands without vision. With vision neither side showed any preference in rate of decrease for either hands or feet. The fact that there were less cases showing decreases with hands than with feet was probably due to the fact that hands were nearer their efficiency

level of performance than feet. In the sixth place, on the basis of shortest trials both hands and feet showed a significant increase of equal performance of the left and right sides with vision. In addition vision of the feet tended to shift the shortest trials away from the left toward the right. Shortest trials for feet without vision were 46% left, 50% right and 5% equal while with vision these became 36% left, 54% right and 11% equal. Shortest trials for hands without vision were 40% left, 53% right and 8% equal while with vision they were 35% left, 47% right and 19% equal.

Sex differences in foot performance with and without vision were wide and varied, but in hand performance with and without vision were hardly noticeable. Without vision sigma increased more for women than men on foot tests. Performance time for feet without vision was increased more for men than women. Lack of vision of the feet increased the differences between sides in performance time more for women than men. Vision increased right preferences in paired differences more for men than women on foot tests. Vision decreased the number of shortest trials on the left side rather markedly for men but not for women. The fact that none of these differences was very noticeable on the hand tests probably indicated that the use of the hands by the two sexes was more similar than the use of the feet in everyday living.

6. INDIVIDUAL ANALYSIS OF DATA FOR GROUP THREE

(1) Individual Analysis of Sensory Data

The individual analysis included shortest trial, paired difference and rate of decrease as in former comparisons.* For the last two or these three comparisons the differences for each foot was added, changed into units and then subtracted. In the former two summaries* the differences on tests were added for each foot and the differences between sums was changed into units. Tables XVII and XVIII should be consulted.

The sensory data for feet showed that 41% of the group with an average of 6.7 units preferred the left foot while 51% with an average of 8.4 units preferred the right foot. Eight percent showed

* Gardner, L. Pearl, Experimental Data on the Problem of Motor Lateral Dominance in Feet and Hands. Psychological Record, 1941, vol. 5, no. 1, 1-63.

no differences in units between sides. Of the group 46% had more shortest trials on the left side and 49% on the right side. On the basis of paired difference 40% had more units on the left and 49% on the right. In rate of decrease there was a significant difference of 33% with more left units and 53% with more right units.

Some sex differences were shown in foot sensory data. Men had more units on the left in 44% of cases and on the right in 48% while women had more on the left in 38% and on the right in 54% of cases. Men had more shortest trial units on the left side and women on the right side. Both sexes showed more right preferences than left for paired differences and rate of decrease. The right side was preferred somewhat more frequently than the left on sensory data with the difference clearer in the case of women.

The hand sensory data showed that 47% of cases had more units on the left side with an average of 5.2 and that 41% had more on the right side with an average of 6.5 units. Twelve percent showed no difference between sides. More shortest trials were on the left side in 46% of cases and on the right in 44%. Paired difference units were on the left side in 38% of cases and on the right in 46%. Rate of decrease units were on the left side in 41% of cases and on the right in 42%.

Sex differences in sensory hand totals showed slight differences between sides in the case of women and a slight left preference in the case of men. Women had 44% of cases with more left units and 42% with more right units. Men had 50% of cases with more left units and 40% with more right units. Men had more shortest trial units on the right side and women on the left. Both men and women showed more cases with more right units in the paired difference comparison. More men showed more left units in rate of decrease and more women showed right units.

For foot sensory data there seemed to be a slight right advantage and for hand sensory data a slight left advantage. The greater use of the finger tips of the right hand with subsequent thickening of the skin may have been a slight factor in left hand preferences in sorting tests. The difference between the two sides as far as these sensory measures showed, had been but slightly developed through practice.

TABLE XVII. Individual Analysis of Data for Men on Sensory and Motor

No. of Subject	Feet—Sensory								Feet—Motor							
	Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
1.	1	....	....	1	1	....	1	....	2	....	8	....	8	....	18	....	....	2
2.	0	0	....	1	....	5	....	6	1	....	....	11	10	....	0	0	3	....
3.	....	1	2	....	4	....	5	....	2	....	....	2	....	4	....	4	1	....
4.	....	1	....	6	0	0	....	7	....	1	1	....	1	....	1	....	....	2
5.	0	0	6	....	3	....	9	....	0	0	....	1	16	....	15	....	....	3
6.	1	....	0	0	....	7	....	6	....	1	....	10	....	4	....	15	....	1
7.	1	....	5	....	4	....	10	....	3	....	3	....	7	....	13	....	....	1
8.	1	....	1	....	....	2	0	0	2	....	....	3	2	....	1	....	3	....
9.	....	1	....	3	2	....	....	2	....	2	1	....	....	1	....	2	1	....
10.	1	....	2	....	1	....	4	....	1	....	9	....	....	1	9	....	....	1
11.	....	1	....	1	....	5	....	7	0	0	1	....	....	2	....	1	....	2
12.	1	....	....	2	0	0	....	1	....	2	....	6	....	2	....	10	....	2
13	....	3	....	6	....	1	....	10	....	2	....	4	4	....	....	2	....	1
14.	....	2	....	2	....	1	....	5	....	2	....	11	....	2	....	15	2	....
15.	....	1	....	1	....	2	....	4	1	....	....	3	2	....	0	0	....	3
16.	1	....	0	0	....	2	....	1	....	2	1	....	....	5	....	6	1	....
17.	....	1	....	13	....	27	....	41	3	....	12	....	4	....	19	....	....	1
18.	0	0	4	....	8	....	12	....	0	0	0	0	....	8	....	8	1	....
19.	1	....	....	1	....	2	....	2	0	0	....	23	....	36	....	59	3	....
20.	....	1	....	3	....	2	....	6	....	1	....	23	....	3	....	27	1	....
21.	....	2	2	....	0	0	0	0	0	0	....	8	....	22	....	30	1	....
22.	....	3	....	5	11	....	3	....	2	....	2	....	1	....	5	....	....	1
23.	1	....	5	....	0	0	6	....	....	2	....	3	2	....	....	3	0	0
24.	....	3	....	2	2	....	....	3	4	....	8	....	1	....	13	....	....	1
25.	....	1	....	6	....	3	....	10	0	0	1	....	0	0	1	....	0	0
26.	....	1	5	....	0	0	4	....	....	3	....	3	....	1	....	7	....	1
27.	1	....	5	....	0	0	6	....	....	1	1	....	1	....	1	....	3	....
28.	1	....	4	....	....	1	4	....	....	1	....	3	0	0	....	4	2	....
29.	....	1	....	3	1	....	....	3	0	0	....	1	....	1	....	2	3	....
30.	3	....	11	....	....	6	8	....	....	2	....	6	....	4	....	12	0	0
31.	1	....	....	3	4	....	2	....	....	2	....	4	3	....	....	3	....	1
32.	1	....	3	....	1	....	5	....	....	2	....	3	3	....	....	2	....	1
33.	....	1	....	9	....	1	....	11	....	4	....	8	....	2	....	14	1	....
34.	1	....	....	1	10	....	10	....	2	....	8	....	2	....	12	....	0	0
35.	3	....	5	....	....	3	5	....	....	2	1	....	5	....	4	....	0	0
36.	1	....	5	....	3	....	9	....	0	0	10	....	3	....	13	....	3	....
37.	....	1	....	13	....	6	....	20	4	....	2	....	4	....	10	....	....	3
38.	1	....	0	0	....	1	0	0	0	0	....	1	4	....	3	....	1	....
39.	....	1	....	8	5	....	....	4	....	4	....	1	....	7	....	12	....	3
40.	1	....	....	3	....	12	....	14	....	1	....	3	7	....	3	....	....	1
41.	3	....	4	....	....	3	4	....	....	4	....	6	14	....	4	....	1	....
42.	....	1	1	....	0	0	0	0	....	1	....	19	....	9	....	29	....	1
43.	2	....	6	....	....	4	4	....	....	2	....	21	....	7	....	30	....	2
44.	....	3	....	4	....	3	....	10	2	....	16	....	18	....	36	....	1	....
45.	1	....	1	....	1	....	3	....	4	....	....	2	....	7	....	5	0	0
46.	3	....	....	2	....	3	....	2	3	....	2	....	4	....	9	....	....	1
47.	....	2	....	3	....	1	....	6	0	0	....	7	9	....	2	....	0	0
48.	....	1	....	1	....	1	....	3	....	2	0	0	....	2	....	4	2	....
49.	0	0	3	....	4	....	7	....	....	3	....	8	....	4	....	15	....	1
50.	1	....	5	....	....	4	2	....	2	....	....	3	....	4	....	5	1	....
Average	1	2	4	4	4	4	6	8	2	2	5	7	5	6	9	12	2	2

no differences in units between sides. Of the group 46% had more shortest trials on the left side and 49% on the right side. On the basis of paired difference 40% had more units on the left and 49% on the right. In rate of decrease there was a significant difference of 33% with more left units and 53% with more right units.

Some sex differences were shown in foot sensory data. Men had more units on the left in 44% of cases and on the right in 48% while women had more on the left in 38% and on the right in 54% of cases. Men had more shortest trial units on the left side and women on the right side. Both sexes showed more right preferences than left for paired differences and rate of decrease. The right side was preferred somewhat more frequently than the left on sensory data with the difference clearer in the case of women.

The hand sensory data showed that 47% of cases had more units on the left side with an average of 5.2 and that 41% had more on the right side with an average of 6.5 units. Twelve percent showed no difference between sides. More shortest trials were on the left side in 46% of cases and on the right in 44%. Paired difference units were on the left side in 38% of cases and on the right in 46%. Rate of decrease units were on the left side in 41% of cases and on the right in 42%.

Sex differences in sensory hand totals showed slight differences between sides in the case of women and a slight left preference in the case of men. Women had 44% of cases with more left units and 42% with more right units. Men had 50% of cases with more left units and 40% with more right units. Men had more shortest trial units on the right side and women on the left. Both men and women showed more cases with more right units in the paired difference comparison. More men showed more left units in rate of decrease and more women showed right units.

For foot sensory data there seemed to be a slight right advantage and for hand sensory data a slight left advantage. The greater use of the finger tips of the right hand with subsequent thickening of the skin may have been a slight factor in left hand preferences in sorting tests. The difference between the two sides as far as these sensory measures showed, had been but slightly developed through practice.

TABLE XVII. Individual Analysis of Data for Men on Sensory and Motor

No. of Subject	Feet—Sensory								Feet—Motor							
	Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
1.	1	....	....	1	1	....	1	....	2	....	8	....	8	....	18	....	....	2
2.	0	0	....	1	....	5	....	6	1	....	....	11	10	....	0	0	3	....
3.	....	1	2	....	4	....	5	....	2	....	....	2	....	4	....	4	1	....
4.	....	1	....	6	0	0	....	7	....	1	1	....	1	....	1	....	....	2
5.	0	0	6	....	3	....	9	....	0	0	....	1	16	....	15	....	....	3
6.	1	....	0	0	....	7	....	6	....	1	....	10	....	4	....	15	....	1
7.	1	....	5	....	4	....	10	....	3	....	3	....	7	....	13	....	....	1
8.	1	....	1	....	....	2	0	0	2	....	....	3	2	....	1	....	3	....
9.	....	1	....	3	2	....	....	2	....	2	1	....	....	1	....	2	1	....
10.	1	....	2	....	1	....	4	....	1	....	9	....	....	1	9	....	....	1
11.	....	1	....	1	....	5	....	7	0	0	1	....	....	2	....	1	....	2
12.	1	....	....	2	0	0	....	1	....	2	....	6	....	2	....	10	....	2
13	....	3	....	6	....	1	....	10	....	2	....	4	4	....	....	2	....	1
14.	....	2	....	2	....	1	....	5	....	2	....	11	....	2	....	15	2	....
15.	....	1	....	1	....	2	....	4	1	....	....	3	2	....	0	0	....	3
16.	1	....	0	0	....	2	....	1	....	2	1	....	....	5	....	6	1	....
17.	....	1	....	13	....	27	....	41	3	....	12	....	4	....	19	....	....	1
18.	0	0	4	....	8	....	12	....	0	0	0	0	....	8	....	8	1	....
19.	1	....	....	1	....	2	....	2	0	0	....	23	....	36	....	59	3	....
20.	....	1	....	3	....	2	....	6	....	1	....	23	....	3	....	27	1	....
21.	....	2	2	....	0	0	0	0	0	0	....	8	....	22	....	30	1	....
22.	....	3	....	5	11	....	3	....	2	....	2	....	1	....	5	....	....	1
23.	1	....	5	....	0	0	6	....	....	2	....	3	2	....	....	3	0	0
24.	....	3	....	2	2	....	....	3	4	....	8	....	1	....	13	....	....	1
25.	....	1	....	6	....	3	....	10	0	0	1	....	0	0	1	....	0	0
26.	....	1	5	....	0	0	4	....	....	3	....	3	....	1	....	7	....	1
27.	1	....	5	....	0	0	6	....	....	1	1	....	1	....	1	....	3	....
28.	1	....	4	....	....	1	4	....	....	1	....	3	0	0	....	4	2	....
29.	....	1	....	3	1	....	....	3	0	0	....	1	....	1	....	2	3	....
30.	3	....	11	....	....	6	8	....	....	2	....	6	....	4	....	12	0	0
31.	1	....	....	3	4	....	2	....	....	2	....	4	3	....	....	3	....	1
32.	1	....	3	....	1	....	5	....	....	2	....	3	3	....	....	2	....	1
33.	....	1	....	9	....	1	....	11	....	4	....	8	....	2	....	14	1	....
34.	1	....	....	1	10	....	10	....	2	....	8	....	2	....	12	....	0	0
35.	3	....	5	....	....	3	5	....	....	2	1	....	5	....	4	....	0	0
36.	1	....	5	....	3	....	9	....	0	0	10	....	3	....	13	....	3	....
37.	....	1	....	13	....	6	....	20	4	....	2	....	4	....	10	....	....	3
38.	1	....	0	0	....	1	0	0	0	0	....	1	4	....	3	....	1	....
39.	....	1	....	8	5	....	....	4	....	4	....	1	....	7	....	12	....	3
40.	1	....	....	3	....	12	....	14	....	1	....	3	7	....	3	....	....	1
41.	3	....	4	....	....	3	4	....	....	4	....	6	14	....	4	....	1	....
42.	....	1	1	....	0	0	0	0	....	1	....	19	....	9	....	29	....	1
43.	2	....	6	....	....	4	4	....	....	2	....	21	....	7	....	30	....	2
44.	....	3	....	4	....	3	....	10	2	....	16	....	18	....	36	....	1	....
45.	1	....	1	....	1	....	3	....	4	....	....	2	....	7	....	5	0	0
46.	3	....	....	2	....	3	....	2	3	....	2	....	4	....	9	....	....	1
47.	....	2	....	3	....	1	....	6	0	0	....	7	9	....	2	....	0	0
48.	....	1	....	1	....	1	....	3	....	2	0	0	....	2	....	4	2	....
49.	0	0	3	....	4	....	7	....	....	3	....	8	....	4	....	15	....	1
50.	1	....	5	....	....	4	2	....	2	....	....	3	....	4	....	5	1	....
Average	1	2	4	4	4	4	6	8	2	2	5	7	5	6	9	12	2	2

Tests in Terms of Units of Difference in Leftness and Rightness.

Hands—Sensory								Hands—Motor						F. and H. Sensory		F. and H. Motor	
Paired Difference		Rate of Decrease		Difference Total		Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Difference Total		Difference Total	
L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
1	....	....	4	....	5	0	0	1	....	....	1	0	0	....	4	9	....
3	....	6	....	12	....	0	0	1	....	....	3	....	2	6	....	....	2
....	1	2	....	2	....	2	....	1	....	....	1	2	....	7	....	...	2
....	5	....	1	....	8	1	....	0	0	....	1	0	0	....	15	1	....
....	5	....	8	....	16	....	3	0	0	....	1	....	4	....	7	11	....
....	3	1	....	....	3	....	3	....	2	....	1	....	6	....	9	....	21
....	2	....	1	....	4	3	....	....	1	....	2	0	0	6	....	13	....
1	....	....	5	....	1	2	....	2	....	1	....	5	....	....	1	6	....
2	....	0	0	3	....	....	2	1	....	2	....	1	....	1	....	....	1
3	....	1	....	3	....	2	....	2	....	0	0	4	....	7	....	13	....
....	3	2	....	....	3	....	2	....	1	0	0	....	3	....	10	....	4
....	2	1	....	....	3	0	0	0	0	0	0	0	0	....	4	....	10
0	0	4	....	3	....	0	0	0	0	0	0	0	0	....	7	....	2
2	....	0	0	4	....	....	3	....	1	....	1	....	5	....	1	....	20
....	5	....	1	....	9	0	0	2	....	0	0	2	....	....	13	2	....
3	....	....	4	0	0	1	....	1	....	....	2	0	0	....	1	....	6
....	1	....	1	....	3	0	0	....	2	1	....	....	1	....	44	18	....
3	....	4	....	8	....	1	....	....	1	1	....	1	....	20	....	....	7
0	0	0	0	3	....	3	....	6	....	1	....	10	....	1	....	....	49
0	0	....	1	0	0	....	2	0	0	0	0	....	2	....	6	....	29
0	0	3	....	4	....	....	1	....	2	....	6	....	9	4	....	....	39
2	....	3	....	4	....	0	0	....	1	1	....	0	0	7	....	5	....
1	....	0	0	1	....	....	2	....	2	....	2	....	6	7	....	....	9
0	0	2	....	1	....	....	3	0	0	1	....	....	2	....	2	11	....
....	1	....	10	....	11	....	2	....	3	....	1	....	6	....	1	....	5
....	12	3	....	....	10	....	4	....	1	1	....	....	4	....	6	....	11
4	....	1	....	8	....	0	0	0	0	3	....	3	....	14	....	4	....
....	7	....	5	....	10	0	0	1	....	....	1	0	0	....	6	....	4
1	....	....	1	3	....	....	4	....	3	1	....	....	6	0	0	....	8
....	5	....	4	....	9	4	....	2	....	0	0	6	....	....	1	....	6
....	5	....	3	....	9	....	2	....	3	1	....	....	4	....	7	....	7
0	0	2	....	1	....	....	2	....	2	1	....	....	3	6	....	....	5
0	0	1	....	2	....	0	0	0	0	....	1	....	1	....	9	....	15
....	2	5	....	3	....	....	4	....	1	0	0	....	5	13	....	7	....
....	1	1	....	0	0	....	3	....	4	....	2	....	9	5	....	....	5
1	....	0	0	4	....	....	2	....	7	....	1	....	10	13	....	3	....
....	3	....	3	....	9	3	....	3	....	1	....	7	....	....	29	17	....
3	....	3	....	7	....	....	3	....	3	....	2	....	8	7	....	....	5
3	....	13	....	13	....	....	3	....	4	....	3	....	10	9	....	....	22
....	1	5	....	3	....	....	1	1	....	1	....	1	....	....	11	4	....
1	....	....	3	....	1	4	....	3	....	3	....	10	....	3	....	14	....
0	0	1	....	0	0	....	1	....	1	....	1	....	3	0	0	....	32
....	5	....	2	....	9	....	3	....	1	....	1	....	5	....	5	....	35
4	....	0	0	5	....	2	....	1	....	1	....	4	....	....	5	40	....
....	5	0	0	....	5	....	4	....	4	4	....	....	4	....	2	....	9
2	....	1	....	2	....	0	0	1	....	1	....	2	....	0	0	11	....
5	....	....	2	3	....	....	2	....	1	....	2	....	5	....	3	....	3
0	0	5	....	7	....	....	2	....	2	....	1	....	5	4	....	....	9
0	0	1	....	0	0	0	0	0	0	0	0	0	0	7	....	....	15
....	4	....	1	....	4	3	....	1	....	....	2	2	....	....	2	....	3
2	4	3	3	4	7	2	3	2	2	1	2	4	5	7	8	10	13

TABLE XVIII. Individual Analysis of Data for Women on Senso

No. of Subject	Feet—Sensory								Feet—Motor							
	Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial		Paired Difference		Rate of Decrease		Diffe To	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	
51.	1	....	0	0	....	4	....	3	0	0	....	1	1	....	0	
52.	3	....	7	....	....	12	....	2	1	....	7	....	3	....	11	
53.	1	....	1	....	0	0	2	....	....	1	....	6	4	....	....	
54.	....	1	....	6	....	2	....	9	....	1	....	2	....	1	....	
55.	....	1	11	....	7	....	17	....	0	0	....	2	....	2	....	
56.	....	1	....	5	....	13	....	19	2	....	1	....	....	4	....	
57.	....	1	....	7	....	4	....	12	....	2	....	4	....	1	....	
58.	....	2	1	....	0	0	....	1	2	....	15	....	2	....	19	
59.	1	....	0	0	14	....	15	....	1	....	32	....	24	....	57	
60.	1	....	3	....	4	....	8	....	....	4	....	20	....	1	....	
61.	....	1	4	....	....	2	1	....	1	....	....	1	....	1	....	
62.	1	....	4	....	4	....	9	....	0	0	....	3	11	....	8	
63.	....	1	....	1	....	2	....	4	....	2	....	3	0	0	....	
64.	....	1	3	....	....	2	0	0	4	....	....	2	0	0	2	
65.	....	1	....	5	....	2	....	8	0	0	....	21	....	12	....	
66.	1	....	4	....	0	0	5	....	....	4	....	8	....	2	....	
67.	....	1	1	....	....	2	....	2	1	....	1	....	0	0	2	
68.	....	1	0	0	....	5	....	6	....	2	....	11	....	5	....	
69.	1	....	2	....	3	....	6	....	0	0	4	....	2	....	6	
70.	....	1	....	7	....	3	....	11	....	4	....	17	3	....	....	
71.	1	....	....	5	6	....	2	....	....	2	....	5	....	8	....	
72.	....	1	....	11	....	8	....	20	....	1	....	10	....	15	....	
73.	....	1	....	6	....	7	....	14	....	2	....	9	11	....	0	
74.	1	....	....	1	....	9	....	9	....	4	....	8	....	2	....	
75.	....	3	....	7	4	....	....	6	0	0	....	7	....	5	....	
76.	1	....	14	....	12	....	27	....	....	4	....	7	....	2	....	
77.	....	1	....	8	0	0	....	9	2	....	....	4	....	1	....	
78.	1	....	8	....	....	5	4	....	0	0	1	....	....	3	....	
79.	3	....	3	....	....	2	4	....	1	....	3	....	18	....	22	
80.	....	3	....	4	....	9	....	16	....	2	1	....	3	....	2	
81.	1	....	0	0	6	....	7	....	....	2	....	5	6	....	....	
82.	1	....	4	....	3	....	8	....	0	0	2	....	1	....	3	
83.	1	....	2	....	5	....	8	....	2	....	11	....	....	3	10	
84.	1	....	....	3	....	5	....	7	0	0	....	3	....	2	....	
85.	....	1	....	6	....	4	....	11	0	0	....	1	5	....	4	
86.	....	1	2	....	8	....	9	....	....	4	....	5	....	4	....	
87.	....	1	....	2	0	0	....	3	....	1	....	1	....	1	....	
88.	1	....	....	8	....	5	....	12	2	....	0	0	....	2	0	
89.	....	1	0	0	0	0	....	1	....	2	....	1	....	1	....	
90.	....	1	....	14	....	4	....	19	....	1	....	8	....	1	....	
91.	....	1	....	9	....	3	....	13	....	4	....	5	....	2	....	
92.	1	....	4	....	4	....	9	....	....	1	....	2	4	....	1	
93.	....	1	0	0	1	....	0	0	....	1	....	10	....	2	....	
94.	....	1	0	0	....	3	....	4	....	1	....	5	....	14	....	
95.	1	....	6	....	....	2	5	....	3	....	7	....	....	8	2	
96.	....	1	0	0	1	....	0	0	....	2	....	1	0	0	....	
97.	2	....	....	1	6	....	7	....	....	2	....	3	10	....	5	
98.	....	1	....	10	....	1	....	12	0	0	....	7	4	....	....	
99.	1	....	....	1	0	0	0	0	4	....	5	....	0	0	9	
100.	0	0	....	8	....	2	....	10	....	3	....	6	2	....	....	
Average	1.	1.	4.	6.	6.	5.	8.	9.	2.	2.	7.	6.	6.	4.	10.	
Average																

	Hands—Sensory								Hands—Motor								F. and H. Sensory		F. and H. Motor	
rence tal	Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Shortest Trial		Paired Difference		Rate of Decrease		Difference Total		Difference Total		Difference Total	
R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
0	2	....	3	....	....	1	4	....	1	....	....	1	0	0	0	0	1	....	0	0
....	1	....	....	2	....	8	....	9	....	3	....	4	....	1	....	8	....	11	3	....
3	....	2	....	5	2	....	....	5	0	0	2	....	0	0	2	....	....	3	....	1
4	2	....	7	....	....	2	7	....	4	....	3	....	....	1	6	....	....	2	2	....
4	3	....	3	....	....	3	3	....	....	2	....	2	2	....	....	2	20	....	....	6
1	1	....	16	....	0	0	17	....	0	0	0	0	0	0	0	0	....	2	....	1
7	2	....	....	4	1	....	....	1	0	0	1	....	1	....	2	....	....	13	....	5
....	1	....	0	0	....	1	0	0	....	1	1	....	....	2	....	2	....	1	17	....
....	....	1	4	....	8	....	11	....	....	1	2	....	0	0	1	....	26	....	58	....
25	1	....	1	....	2	....	4	....	....	2	....	2	0	0	....	4	12	....	....	29
1	0	0	....	1	....	1	....	2	2	....	2	....	....	2	2	....	....	1	1	....
....	3	....	6	....	9	....	18	....	3	....	3	....	0	0	6	....	27	....	14	....
5	1	....	0	0	0	0	1	....	0	0	1	....	0	0	1	....	....	3	....	4
....	1	....	....	4	....	2	....	5	0	0	....	3	2	....	....	1	....	5	1	....
33	....	3	....	1	....	5	....	9	2	....	2	....	0	0	4	....	....	17	....	29
14	....	2	....	2	....	1	....	5	2	....	1	....	1	....	4	....	0	0	....	10
....	....	1	....	1	....	3	....	5	....	3	....	2	....	1	....	6	....	7	....	4
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....	1	....	3	....	0	0	4	....	....	4	....	3	1	....	....	6	10	....	0	0
18	3	....	6	....	2	....	11	....	....	2	....	2	1	....	....	3	0	0	....	21
15	....	3	....	6	0	0	....	9	0	0	1	....	2	....	3	....	....	7	....	12
26	1	....	5	....	....	3	3	....	1	....	....	2	....	1	....	2	....	17	....	28
0	....	1	5	....	0	0	4	....	4	....	1	....	....	2	3	....	....	10	3	....
14	....	1	0	0	1	....	0	0	2	....	....	2	2	....	2	....	....	9	....	12
12	....	2	....	2	5	....	1	....	1	....	1	....	2	....	4	....	....	5	....	8
13	....	2	....	7	....	5	....	14	....	1	....	1	....	1	....	3	13	....	....	16
3	1	....	11	....	0	0	12	....	2	....	1	....	2	....	5	....	3	....	2	....
2	....	1	2	....	....	1	0	0	0	0	....	1	....	2	....	3	4	....	....	5
....	1	....	2	....	1	....	4	....	0	0	0	0	1	....	1	....	8	....	23	....
....	1	....	5	....	5	....	11	....	1	....	....	1	....	2	....	2	....	5	0	0
1	....	2	....	1	0	0	....	3	....	4	....	2	....	1	....	7	4	....	....	8
....	1	....	4	....	....	1	4	....	....	2	....	1	1	....	....	2	12	....	1	....
....	1	....	0	0	....	1	0	0	....	4	....	6	1	....	....	9	8	....	1	....
5	0	0	....	2	....	1	....	3	0	0	0	0	....	1	....	1	....	10	....	6
....	0	0	....	8	....	5	....	13	1	....	....	1	....	2	....	2	....	24	2	....
13	....	3	....	2	6	....	1	....	1	....	0	0	0	0	1	....	10	....	....	12
3	....	3	....	6	....	4	....	13	....	1	....	2	2	....	....	1	....	16	....	4
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4	....	1	....	3	0	0	....	4	....	2	....	3	....	1	....	6	....	5	....	10
10	1	....	0	0	....	2	....	1	....	1	....	3	0	0	....	4	....	20	....	14
11	....	1	....	4	....	6	....	11	0	0	0	0	0	0	0	0	....	24	....	11
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13	1	....	....	1	4	....	4	....	....	2	0	0	0	0	....	2	4	....	....	15
20	1	....	2	....	2	....	5	....	....	2	....	2	1	....	....	3	1	....	....	23
....	1	....	1	....	....	5	....	3	0	0	0	0	0	0	0	0	2	....	2	....
3	....	1	....	2	0	0	....	3	....	2	....	2	0	0	....	4	....	3	....	7
....	1	....	1	....	0	0	2	....	1	....	2	....	2	....	5	....	9	....	10	....
3	....	2	....	7	....	1	....	10	1	....	0	0	....	1	0	0	....	22	....	3
....	....	1	....	2	3	....	0	0	....	2	....	3	0	0	....	5	0	0	4	....
7	....	1	0	0	4	....	3	....	0	0	1	....	....	2	....	1	....	7	....	8
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Combined foot and hand sensory data showed 39% of cases with more left units and 55% of cases with more right units. Both sides showed the same average of 9 units. The sexes showed practically the same percent of cases on both sides as the figures above but the men average 7.3 units with the left and 7.8 units with the right while women averaged 10 units with each hand.

Foot and hand sensory units showed differences on the same side in 38% of cases with 18% on the left and 20% on the right. Foot and hand sensory units were on the opposite sides in 44% of cases with 18% in the left-foot-right-hand group and 26% in the right-foot-left-hand group. In 18% of cases zero differences occurred in either hands or feet.

(2) Individual Analysis of Motor Data

Foot motor data showed that 37% of cases had more units on the left side with an average of 9.6 units while 58% had more on the right side with an average of 11 units. Only 5% showed no difference between sides. More shortest trials were on the left side in 29% of cases and on the right in 50%. Units of paired difference were on the left side in 31% of cases and on the right in 66% with a slightly higher average for the right side. A greater rate of decrease was shown on the left side by 43% of cases and on the right in 50% with the average slightly higher for the left side.

In foot motor data women consistently showed a stronger right preference than men. For the difference totals men had 42% left preference and 54% right preference while women had 32% left preference and 62% right preference. In shortest trials men had 32% left preference and 48% right preference while women had 26% left preference and 52% right preference. In the paired difference comparison men had 36% left preference and 60% right preference while women had 26% left preference and 72% right preference. In rate of decrease 50% of men had more units on the left side and 46% on the right while women had 36% on the left and 54% on the right.

For motor hand data 32% of the group had more units on the left with an average of 3.5 units and 54% on the right with an average of 4.2 units. On the three bases of comparison shortest

trials showed the greatest right superiority. Although 24% showed no difference in shortest trials 29% had more on the left side and 47% on the right side. In paired differences 33% of cases had more units on the left and 49% on the right. No difference in rate of decrease was shown in 25% of cases with the rest of the cases nearly equally divided in preference for the sides. A rather large number of cases showed no difference in units on the various bases of comparison.

There were no noticeable differences between the sexes in motor hand performance. The percent of preference was remarkably similar for all comparisons.

Combined foot and hand motor data showed 34% of cases with an average difference of 9.8 units on the left side and 62% of cases with an average difference of 12. units on the right side. Right preferences were clear for both hands and feet, but somewhat greater in the case of feet.

Foot and hand motor units were on the same side in 44% of cases with 12% of these on the left side and 32% on the right side. Foot and hand units were crossed in 38% of cases with 20% left-footed-right-handed and 18% right-footed-left-handed. Of the men 16% and of the women 8% had both foot and hand units on the left side. Both sexes had 32% of cases with hand and foot units on the right side. Eighteen percent of men and 22% of women were left-footed-right-handed while 12% of men and 24% of women were right-footed-left-handed.

Were motor and sensory foot preferences on the same side? In the group 51% of cases had sensory and motor preferences on the same side with 18% on the left and 33% on the right. Thirty-six percent of cases had the preferences on opposite sides with 22% left-footed on sensory data and right-footed on motor data while 14% were right-footed on sensory data and left-footed on motor data. Zero differences occurred in 13% of cases in either sensory or motor data.

Motor and sensory hand preferences were on the same side in 40% of cases with 19% on the left side and 21% on the right side. Differences were crossed in 36% of cases with 24% left-handed

on sensory data and right-handed on motor data and with 12% right-handed on sensory and left-handed on motor data. Twenty-four percent of cases showed zero differences in either motor or sensory data.

Motor and sensory data for combined foot and hand tests showed 52% of cases with units on the same side of which 15% of cases were on the left and 37% on the right side. In 38% of cases cross relationships were shown with 21% left-sided on sensory data and right-sided on motor data and with 17% right-sided on sensory data and left-sided on motor data. Zero differences occurred in 10% of cases.

7. SUMMARY OF DATA

A preliminary testing of 40 students on sensory tests of feet and hands gave conflicting results. Another group of 100 college students were given 3 sensory tests for both hands and feet and several motor tests with and without vision.

(1) Sensory Laterality in Feet

Results on the foot sensory tests showed no large preference for either side. The slight right preference was more pronounced in the case of women than men. Means on the foot tests differed less than 10 seconds with right means less than left ones in 2 of 3 tests. The right midscores were less than left ones in all 3 tests. The average error on the 3 tests combined was the same for both feet. On 2 of the 3 tests there were more cases quicker with the left foot but an average of the 3 tests showed 49% quicker with the left and 50% with the right. On 2 of the 3 tests right sigmas were greater than left ones.

(2) Sensory Laterality in Hands

Results on hand sensory tests showed even less difference than feet between the two sides. Two of the 3 means were equal with one smaller for the right side. The average error on combined hand tests was 0.9 for the left and 0.5 for the right. The percent of preference was equal on one test with one test favoring the right and one the left side.

(3) Motor Foot Tests With and Without Vision

Without vision variability and mean performance time increased somewhat more for the left than for the right foot. Without vision the difference between the sides on the basis of the average of the three means was double the difference with vision.

Vision tended to increase right preferences over left. The average for the percent of preference on the three tests without vision was 35% left, 51% right and 13% equal while with vision this became 28% left, 53% right and 19% equal. On the three tests without vision the difference between the left and right percent of preference averaged 15.6 more for the right while with vision the average was 25.0 more for the right. The average for the shortest trials without vision was 45% left, 50% right and 5% equal while with vision this became 36% left, 54% right and 10% equal.

The effect of vision varied somewhat with the sexes. Sigma was increased more for women than men with both feet without vision. Lack of vision increased the time of performance more for men than for women. Lack of vision exaggerated the difference between sides somewhat more for women than for men. Vision decreased left efficiency, increased right efficiency and produced more cases of equal efficiency for both sexes, somewhat more in the case of men than women. This was shown both by the percent of preference on the basis of paired trials and on the basis of shortest trials.

(4) Motor Hand Tests With and Without Vision

Without vision variability and mean performance time increased about the same for both hands. Without vision there was slightly more difference between the left and right hands than with vision. Vision tended to produce equality of performance for hands on the basis of both percent of preference and shortest trials. Sex differences were not evident in hand performance.

(5) Comparison of Motor Foot and Hand Tests With and Without Vision

Lack of vision produced greater variability in feet than in hands. Lack of vision more than doubled foot means and less than doubled hand means. Without vision the difference between the two sides was exaggerated, more for feet than for hands. Vision tended to

increase the percent of right preferences in feet but not in hands. The percent of preference for feet and hands without vision was very similar. A comparison of decrease of performance time from first to third repetitions showed lack of vision more favorable for decreasing time than vision in the case of both hands and feet. Vision caused a great increase in the number of cases for both feet and hands with equal speed on the shortest trials. Vision for feet tended to shift shortest trial preferences away from the left toward the right side. Sex differences were evident in foot performance but not in hand performance without vision.

(6) Individual Analysis of Sensory Data

Individual analysis of lateral preference was made for both sensory and motor data on the basis of shortest trials, paired difference in performance time and rate of decrease in performance time from first to last trials in terms of units.

Sensory data for feet showed that 41% of the group with an average of 6.7 units preferred the left foot, that 51% with an average of 8.4 units preferred the right foot and that 8% showed no difference in units between sides. On foot sensory tests women showed somewhat more right preferences than men.

Sensory data for hands showed that 47% of cases had more units on the left side with an average of 5.2 units, that 41% had more units on the right side with an average of 6.5 units, and that 21% showed no difference between sides. Sex differences on hand sensory units were slight.

Combined foot and hand sensory data showed 39% of cases with more left units and 55% with more right units with each side averaging 9 units. Foot and hand sensory units were on the same side in 38% of cases with 18% on the left and 20% on the right side.

(7) Individual Analysis of Motor Data

Motor foot data showed that 37% of cases had more units on the left side with an average of 9.6 units, that 58% had more units on the right side with an average of 11 units, and that 5% showed no difference between sides. Women consistently showed a stronger right preference than men.

Motor hand data showed 32% of cases with more units on the left side with an average of 3.5 units and 54% on the right with an average of 4.2 units. Sexes performed similarly on hand tests.

Combined hand and foot motor data showed 34% of cases with an average difference of 9.8 units on the left side and 62% of cases with an average difference of 12.0 units on the right side. Foot and hand motor units were on the same side in 44% of cases with 12% of these left and 32% right.

For individual cases motor and sensory data tended to be on the same side. For motor and sensory foot data, 51% of cases had differences on the same side with 18% left and 33% right while 36% of cases showed crossed relationships. For motor and sensory hand data, 40% of cases had differences on the same side with 19% on the left side and 21% on the right side while 36% of cases showed crossed relationships. For motor and sensory data on combined hand and foot tests, 52% of cases had differences in units on the same side with 15% left and 37% right while 38% of cases had crossed relationships. Cases with zero differences in hand and foot data were not classified.